MOOD MANAGEMENT IN BIPOLAR DISORDER: A FIVE STAGE PROCESS

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ABBREVIATIONS

BD = Bipolar Disorder

SRM = Self Regulation Model

CS = Coping Strategies

BAS = Behavioural Activation System

BIS = Behavioural Inhibition System

ICS = Interacting Cognitive Subsystems

SPAARS = Schematic, Propositional, Analogical and Associative Representational Systems

ICM = Integrative Cognitive Model

HIQ = Hypomanic Interpretations Questionnaire

IDQ = Interpretations of Depression Questionnaire

RPA = Responses to Positive Affect Scale

RSQ = Response Style Questionnaire

BIPQ = Brief Illness Perception Questionnaire

EWS = Early Warning Signs

ESM = Experience Sampling Methodology

MI = Mood Induction

MIP = Mood Induction Procedure

PA = Positive Affect

NA = Negative Affect

PCA = Principal Components Analysis

MLM = Multi-Level Model

VAS = Visual Analogue Scale

ABSTRACT

The clinical effectiveness of psychological interventions for bipolar disorder (BD) may be enhanced by having a coherent psychological model of BD, which amalgamates many of the concepts proposed in the existing psychological models of BD and some which are not.

This PhD aimed to expand on the Self Regulation Model (SRM; Leventhal et al., 1984) framework to enhance understanding of mood identification and regulation in BD. The mood management model proposed was tested using three methodologies (namely experience sampling, mood induction and a cross-sectional survey design) to provide insight into mood management processes in daily life, following controlled mood manipulation and in response to self-report questionnaires in a large sample of people with BD from across the North West of England and Nottingham.

Demonstrating differences between euthymic bipolar participants and healthy controls regarding the psychological processes that underlie the self-regulation of mood may inform psychological interventions. Compared to healthy controls, people with BD reported more variability in mood, perceived more positive consequences, less personal control, less understanding, a shorter duration of mood and made more internal attributions for hypomanic and depressive experiences. Furthermore, while people with BD reported implementing helpful coping strategies (CS) to manage low mood, the most commonly used CS for mania were related to stimulating behaviours that would likely escalate mood and were rated as unhelpful by participants themselves.

The current results support the application of the SRM to BD and the importance of expanding this model to explain mood management in BD. The clinical implications, limitations and avenues for future research are discussed.

DECLARATION

Data for Study 1 (Chapter 3) was collected in collaboration with two doctoral researchers at Lancaster University. All data analysis and write-up was conducted independently.

The work contained in this thesis has not previously been submitted for a qualification at this or any other university.

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CHAPTER 1: INTRODUCTION

1.1 Rationale for the current research

Since 2009 I have been employed as full-time Research Assistant (RA) on the largest study in the National Institute of Health Research (NIHR) funded PARADES programme based at Lancaster University: the Psychoeducation Randomised Controlled Trial (RCT) investigating the effectiveness of group psychoeducation versus peer support for people with bipolar disorder (BD). Alongside my RA post I have studied as a full-time PhD student, conducting my own research into mood management in BD which has formed this thesis. This PhD was motivated by several factors. Firstly, an interest in BD fuelled by employment on the PARADES RCT. Secondly, the observed need for a coherent psychological model of BD, which amalgamates many of the concepts proposed in the existing models of BD and some which are not. Having one over-arching model of BD would enhance the clinical effectiveness of psychological interventions for this group. This PhD aimed to expand on the Self Regulation Model (SRM; Leventhal, Nerenz & Steele, 1984) framework to enhance understanding of mood identification and regulation in BD. The mood management model proposed was tested using three methodologies (namely experience sampling, mood induction and a cross-sectional survey design) to provide insight into mood management processes in daily life, following controlled mood manipulation and in response to self-report questionnaires in a large sample of people with BD from across the North West of England and Nottingham.

The fundamental tension between the psychological approach to the current research and the predominantly diagnostic paradigm that has informed the design of the current studies should be acknowledged at the outset. Using a diagnostic approach potentially ignores individual differences in the experience of symptoms, the underlying causes for these experiences and has been criticised for setting arbitrary cut-offs for disorders versus normal experiences (British Psychological Society, 2010; National Institute for Mental Health, 2013). However, while there is an ever increasing shift away from a

diagnostic approach to psychological research (e.g. National Institute for Health Research RDoC), such research is still relatively new. Furthermore, UK National Institute for Health and Clinical Excellence (2006) guidelines still structure their recommendations for treating people with BD around the diagnostic criteria set out in the Diagnostic and Statistical Manual-IV (APA, 2000) and having a diagnosable mental illness is a pre-requisite for access to mental health services. This thesis uses a diagnostic paradigm but acknowledges the limitations associated with this approach.

1.2 Bipolar Disorder

The following section provides a summary of the background information relating to bipolar disorder (BD) in order to situate the current research within the wider literature and what is already known about BD.

1.2.1 Diagnosing Bipolar Disorder (BD)

BD is a mood disorder characterised by extreme highs (hypomania/mania) and lows (depression) in mood. The DSM-IV (APA, 2000) outlines the characteristic signs and symptoms of BD and is referred to for diagnosis (see Table 1 for the DSM-IV diagnostics criteria for each bipolar episode type). The DSM-IV outlines 4 subtypes of BD: BD I, BD II, cyclothymia and BD not otherwise specified (NOS). For a diagnosis of BD I an individual must have experienced one or more manic episodes, with or without one or more major depressive or mixed episodes. In BD II the individual has had at least one major depressive episode and at least one hypomanic episode but no manic or mixed episodes. In both BD I and II, the symptoms associated with depressed mood (and elevated mood in BD I) cause clinically significant distress or functional impairment (occupational/social). Symptoms must not be better explained by another disorder i.e. psychosis, substance disorders or a general medical condition (APA, 2000). Cyclothymia is characterised by manic and depressive

symptoms that are not severe enough to meet psychiatric criteria but that have been present for at least two years with symptom-free periods lasting less than 2 months. Akiskal et al. (1979) noted that mood changes in cyclothymia are short, the course biphasic and may predispose the individual to BD. A diagnosis of BD NOS is given if an individual presents with symptoms that cannot be categorised under the subtypes described (APA, 2000).

Note that DSM-V has been published since this thesis was written but the DSM-IV is referred to throughout because it was current at the time of this research. The DSM-V changes for BD are not major but are worth noting here. Firstly, BD now has its own chapter 'Bipolar and Related Disorders' rather than being included in a Mood Disorders chapter along with Major Depression. Secondly, in addition to evident changes in mood, the criteria for a hypomania and mania episodes now includes emphasis on changes in activity and energy. Thirdly, the diagnosis of a BD I mixed episode has been removed and instead a 'specifier' ('with mixed features') is now added to any mood (mania, hypomania or depression) to denote the simultaneous experience of mania/hypomania and depression. Finally, the BD NOS diagnosis has been replaced with a diagnosis of 'Other Specified Bipolar and Related Disorder' which includes the categorisation of 1) people with a history of depressive episodes who meet all criteria for hypomania except duration and 2) people who fall short of the criteria for BD II because they meet all criteria for hypomania except number of symptoms.

Table 1: Diagnostic Criteria According to the DSM-IV (APA, 2000)

Episode type	*Depression*	*Mania (BD I only)*	*Hypomania*	*Mixed episode*
Characterised by....	...low mood or a loss of interest/pleasure in activities usually enjoyed by the individual for at least 2 consecutive weeks.	... a distinct period of abnormally and persistent elevated or irritable mood lasting at least 1 week or requiring hospitalisation.	... elevated or irritable mood persisting for at least 4 days and representing a change from usual mood.	...an individual meeting criteria for both a manic and depressive episode (with the exception of duration) nearly every day for 1 week.
Additional symptoms	At least 4 of the following symptoms must be present for the same 2 week period: significant weight loss/gain or decrease/increase in appetite; insomnia or hypersomnia; psychomotor agitation or retardation; fatigue or loss of energy; feelings of worthlessness or excessive/inappropriate guilt; diminished ability to concentrate or indecisiveness; recurrent thoughts of death, suicidal ideation or suicide attempt.	At least 3 (4 if mood is irritable rather than elevated) of the following symptoms must be present for the same 1 week period: inflated self-esteem; decreased need for sleep; more talkative or pressure of speech; racing thoughts; distractibility; increased goal-directed behaviour; increased involvement in pleasurable yet risky activities.	At least 3 (4 if mood is irritable rather than elevated) of the additional symptoms listed for mania must also be present for the same period of mood disturbance in hypomania.	See symptoms of depression and mania.
Impairment in functioning?	Symptoms must cause clinically significant distress or impairment in functioning.	Symptoms must cause clinically significant impairment in functioning, necessitate hospitalisation or include psychotic features	The period of mood disturbance must represent an observable change from the individual's normal presentation but must not be severe enough to cause significant functional impairment.	Symptoms must cause clinically significant impairment in functioning, necessitate hospitalisation or include psychotic features.
Symptoms must not be due to....	...the effects of substance use, a general medical condition or bereavement.	...the effects of substance use or a general medical condition.	...the effects of substance use or a general medical condition.	... the effects of substance use or a general medical condition.

1.2.2 The bipolar spectrum

Some researchers have advocated a broader concept of BD (see Paris, 2009 for a review). Angst and colleagues suggest that the definition and diagnostic criteria for BD II and subthreshold BD is debatable. This may be due to the majority of research focussing on mania (and DSM-IV criteria) rather than hypomania in BD II and subthreshold BD. Correct diagnosis may be delayed by 8-10 years with individuals initially being misdiagnosed with unipolar depression (Angst, 2007). Angst et al. have provided evidence for a broad spectrum of BD which includes more subtle forms such as brief hypomania lasting 1-3 days (Angst, 1998; Angst et al., 2003) and minor BD which is characterised by dysthymia, minor or recurrent brief depression plus hypomania (Angst & Gamma, 2002) and has a lifetime prevalence rate of 3.2% (Angst et al., 2003). More recently Angst et al. considered hypomanic reactions to antidepressants, subthreshold hypomania and depression plus non-manic markers of BD as part of the bipolar spectrum. They further posited that the BD NOS category of the DSM-IV should be extended to include individuals who do not meet diagnostic criteria because of the *number* of hypomanic symptoms (rather than just *duration* of symptoms as already included in DSM-IV) but who meet full depression criteria (Phelps, Angst, Katzow & Sadler, 2008). See Section 1.2.1 for refinement to the DSM-IV.

In line with Angst et al.'s suggestions, the UK National Institute for Health and Clinical Excellence (NICE; 2006) also states that evidence for treating BD II is limited compared to BD I and caution should be paid when applying treatment recommendations for BD I to BD II. Thus, more epidemiological research into BD II and 'softer' forms of BD is needed. Further, evidence for the existence of a bipolar spectrum has important implications for the diagnosis and treatment of bipolar disorders. Without attention to a broader spectrum of BD, depressive disorders may be over-diagnosed (Angst, 2007; Smith, Ghaemi, & Craddock, 2008). Additionally, the broadening of the bipolar spectrum means that affective dysregulation that would not have received attention in the past may now be

considered part of the bipolar spectrum. Thus, people presenting with more subtle symptoms may receive a diagnosis and access to treatment. This may help these people cope with more subtle mood changes and prevent escalation of minor mood fluctuations. On the downside, broadening the concept of BD may lead to increased stigmatisation due to increased labelling of symptoms that were once considered part of normal mood fluctuation.

1.2.3 Prevalence rates

Statistics regarding prevalence rates for BD vary, with some studies reporting higher prevalence of BD I and others of BD II. According to the DSM-IV prevalence rates for BD I are between 0.4 and 1.6%, 0.5% for BD II and between 0.4 to 1% for cyclothymia (APA, 2000). In a US sample of 9282 adults Merikangas et al. (2007) reported lifetime prevalence estimates of 1.0% for BD I, 1.1% for BD II, and 2.4% for subthreshold BD. In a larger sample of 61,392 adults across 11 countries in America, Europe and Asia, Merikangas et al. (2011) reported lifetime prevalence rates of 0.6% for BD I, 0.4% for BD II, 1.4% for subthreshold BD and 2.4% for bipolar spectrum disorders. A review of data from epidemiological studies using DSM-III-R, DSM-IV or ICD-10 criteria in EU countries (Pini et al., 2005) found that a number of studies have reported higher prevalence rates (around 6%) when bipolar spectrum disorders are taken into account and prevalence rates as high as 11.3% have been reported previously (Angst, 1998; Angst et al., 2003). Reviews of epidemiological studies using DSM-IV criteria have reported prevalence rates for BD I of around 1-2% (Merikangas & Pato, 2009; Oswald et al., 2007) and found equal rates of BD reported in men and women but a tendency for women to have BD II. Additionally, lifetime comorbidity with additional axis I disorders (particularly anxiety disorders) is common in BD (Merikangas et al., 2007; 2011).

1.2.4 Socio-demographic features and impact on functioning

Some studies have reported low levels of education in BD, for example Merikangas et al. (2007) reported that BD was inversely related to educational level. Other studies have reported high levels, for example Kogan et al. (2004) reported that the average level of education among 1000 participants with BD was notably higher than the median level for the US population. Despite the latter report, unemployment rates in BD are high. For example, in a cohort of 3000 people with BD Kupfer et al. (2002) reported that 64% of the sample were currently unemployed and Morselli, Elgie and Cesana (2004) reported that less than 50% of people with BD living in Europe were in paid employment. In a recent review of predictors of employment in BD (Gilbert & Marwaha, 2013) cognitive deficits, depression and level of education were the most commonly reported predictors of employment in BD. Depression and sub-syndromal depression also had a negative impact on employment.

Little difference has been reported between the number of people with BD who were married/cohabiting or single (Kogan et al., 2004; Suppes et al., 2001), but BD has been reported to be higher in people who were separated, divorced or widowed compared to those married or never married (Merikanages et al., 2007).

The impact of BD on everyday functioning is considerable. People with BD have a 12.3 time higher rate of suicide than the general population (Angst & Gamma 2002) and when bipolar subtypes are considered, 25% of people with BD I, 20% with BD II, and 10% with subthreshold BD report a history of suicide attempts (Merikangas et al., 2011). Additionally, symptom severity has been found to increase from subthreshold BD to BD I, yet role impairment is similar across bipolar subtypes (Merikangas et al., 2011). BD is associated with loosing on average 14 years of productive activity and reducing life by an average of 9 years (Prien & Potter, 1990). Responses to the 2000 National Depressive and Manic-Depressive Association (NDMDA) survey revealed that BD had a negative impact on the individual, their relationships (familial and social) and employment (Hirschfeld et al., 2003).

Thus, BD not only effects the individual but can have a big impact on family and friends and costs the UK in excess of £5 billion per annum (estimated 2007 value; McCrone, Dhanasiri, Patel, Knapp & Lawson-Smith, 2007).

1.2.5 Age of onset and course of BD

Establishing age of first onset of BD is difficult due to data collection by retrospective reports and the related biases. However, most frequently reported first onset of BD is generally agreed to be in late adolescence and early adulthood (Pini et al., 2005). For example, ten Have, Vollebergh, Bijl & Nolen (2002) found that 40% of BD participants aged 18 to 65 years had an onset age of between 18 and 24 years. When bipolar subtypes are considered, reports of onset for BD I (around 18 years) are earlier than for BD II (around 20 years) and subthreshold BD (around 22 years) (Merikangas et al., 2007; 2011). Waraich, Goldner, Somers and Hsu (2004) reported similar prevalence rates of BD I across 1-year and lifetime, suggesting that BD is relatively stable from onset across adulthood.

Indeed, BD is viewed as a recurrent disorder with an increasingly severe course (Judd et al., 2002; Suppes et al., 2001). ten Have et al. (2002) reported that people with BD experience a mean of 8 (5 manic and 3 depressive) episodes and symptom severity and role impairment is reported to be higher in depression than mania (Merikangas et al., 2011). Even between episodes people with BD often experience significant subsyndromal symptoms despite access to medication (Judd et al., 2002).

It is worth noting that some of the statistics reported are based on people in long term contact with mental health services, therefore excluding those not in contact with services that may have very good outcomes, thus painting a rather negative picture of BD. The former group of people are less likely to take part in the research that follows. Even so, results from the current research will have implications for more enduring cases of BD within the general population. These statistics do, however, reflect that any research that may help

to identify treatment interventions for BD is important not only for the individual experiencing the symptoms but for society as a whole.

1.2.6 Treatment

The NICE Guideline for Bipolar Disorder is currently being reviewed, but the existing version (2006) recommends lithium, olanzapine or valproate for the long-term treatment of BD. If relapses or functional impairment persist, switching to an alternative monotherapy or using prophylactic medications in combination is suggested. If this is ineffective lamotrigine or carbamazepine may be introduced. Long-term use of antidepressants is not recommended due to limited evidence of reducing relapse and increased risk of mania. For chronic or recurrent depressive symptoms selective serotonin reuptake inhibitors (SSRIs) plus prophylactic medication, cognitive behavioural therapy (CBT) plus prophylactic medication, quetiapine or lamotrigine are recommended.

Medication is the most widely used treatment for BD (Goodwin & Jamison, 1990). Ninety seven percent of the respondents to the 2000 NDMDA survey were taking some form of psychiatric medication and 80% were taking several medications (Hirschfeld et al., 2003). In a more recent prospective study of data collected between 1996 and 2002 from 249 outpatients with BD, Post et al. (2010) found lithium (51%) and valproate (42%) were the most frequently prescribed medications at the time of clinical improvement (remission for at least 6 months), which took on average 18 months. The sample displayed complex medication regimes, with a mean of 2.98 medications at time of improvement. Interestingly, over half of the sample showed no or insufficient response to pharmacological treatment.

In a recent review of the evidence pertaining to the long-term treatment of BD in adults Grunze et al. (2013) concluded that it is not possible to give an overall recommendation for long-term pharmacological treatment of BD, rather specific cases must be examined separately with regard to bipolar subtype, the type of episode being treated,

the experience of the individual with the medication, and individual clinical history. Across cases, lithium was reported to be the medication with the largest evidence base.

However, medication alone does not always protect from relapse in BD (Judd et al., 2002) and there are additional concerns about using medication as the sole treatment for BD. For example, adherence to long-term medication regimes, delayed response, negative side-effects, reluctance to eradicate symptoms and increased risk of relapse if medication is stopped. Thus, treating BD from a solely pharmacological perspective view is limited. Indeed, NICE (2006) recommends psychological therapy such as CBT in addition to prophylactic medication. Therapy is recommended to include psychoeducation (with specific regard to the importance of a regular routine and medication adherence) and information on mood monitoring, early warning sign detection and coping strategies.

By addressing the issues raised concerning drug treatment psychological interventions such as psychoeducation may enhance a collaborative approach that utilises medication plus psychological intervention. Using medication alone ignores the psychological challenges of living with BD and the use of self management techniques, such as early warning sign recognition, which have been shown to impact significantly on outcome (see Stafford & Colom, 2013 for a review).

There is now an increasing body of evidence to support the role of psychological factors in the development and maintenance of BD, indicating that psychological interventions are important in the treatment of BD. A review and critique of the six most relevant (to the current thesis) theories of emotion in BD will now follow (Section 1.3) with a view to highlighting where they overlap (Section 1.3.7) in order to develop an overarching model of BD for testing in the current research (Section 1.4).

1.3 Psychological models of bipolar disorder (BD)

Psychological models of BD provide a context for understanding the psychological, biological and environmental factors associated with the disorder. Development of more effective treatments for BD depends on the refinement of these models and may benefit from the development of a single model that incorporates common aspects proposed in a number of the models previously developed to understand BD.

1.3.1 The Cognitive Therapy model

1.3.1.1 The original cognitive model

Beck's cognitive model (Beck, 1967) was originally developed to explain unipolar depression (Figure 1). It suggests that childhood experiences lead to the development of maladaptive cognitive patterns (negative cognitive triad) and dysfunctional beliefs e.g. 'I am worthless'. These patterns and beliefs lead to a cognitive vulnerability to depression, which heightens risk of depression and amplifies depressive states in the face of a stressful life event. When confronted with a stressful life event, maladaptive and dysfunctional beliefs are activated, causing the production of negative automatic thoughts, which in turn cause the onset of depressed mood. For example, a person who holds the belief 'I am worthless' may experience depression in the face of failure. A collection of studies has investigated this cognitive vulnerability-stress approach in relation to depression (for a review see Abramson et al., 1999).

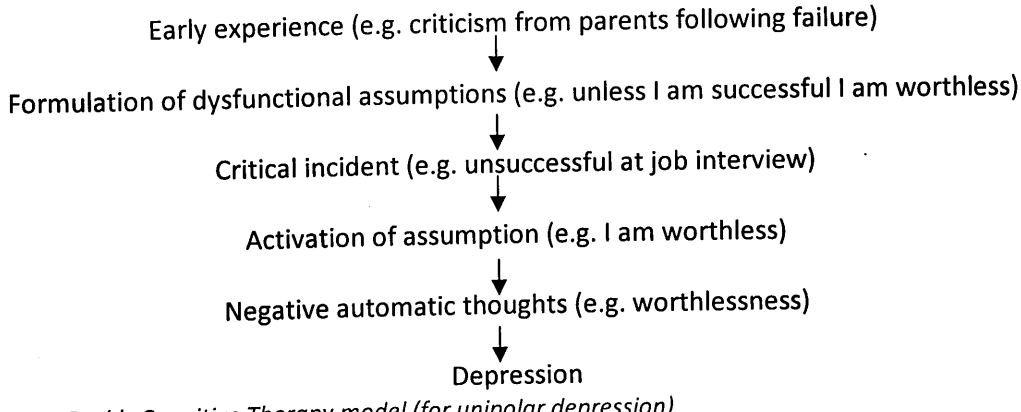


Figure 1: Beck's Cognitive Therapy model (for unipolar depression)

1.3.1.2 The cognitive model and BD

Newman, Leahy, Beck, Reilly-Harrington, and Gyulai (2002) specifically applied Beck's theory to BD, suggesting that the polarity of schemas held by an individual shifts with mood state and life events. Thus, cognitive styles during mania are characterised by an opposing positive triad where positive cognitive distortions are applied to events ultimately leading to a vulnerability to mania.

Research has been conducted to examine dysfunctional attitudes in BD of the type described in Beck's original theory. The Dysfunctional Attitudes Scale (DAS; Weissman & Beck, 1978) has been used in most of the studies aimed at testing Beck's theory and many of the cognitive variables associated with unipolar depression have been found to be involved in BD (see Alloy, Abramson, Walshaw & Neeren, 2006 for a review). For example, Alloy, Reilly-Harrington, Fresco, Whitehouse and Zechmeister (1999) found that students with subsyndromal BD (cyclothymia) displayed similar cognitive styles to students with subsyndromal unipolar depression (dysthymia) and both groups scored higher on the DAS than controls. Similarly, Reilly-Harrington, Alloy, Fresco and Whitehouse (1999) found that students diagnosed with bipolar spectrum disorders (BD I, BD II, cyclothymia) displayed similar cognitive styles to students diagnosed with unipolar mood disorders (major, minor, intermittent) and again, both groups scored higher than controls. Scott and Pope (2003) later compared cognitive styles in unipolar and bipolar participants using the DAS and also examined cognitive styles in the different phases of BD (remission, depression and hypomania). Dysfunctional attitudes held by the unipolar and bipolar groups were similar, giving further support to the application of Beck's theory to BD. However, hypomanic bipolar participants were found to score higher (mean DAS scores) than remitted participants but lower than depressed participants suggesting that hypomania does not represent the polar opposite of depression.

Other studies have found that people with BD show elevated dysfunctional attitudes compared to people with unipolar depression that may relate to mania. Lam, Wright and Smith (2004) conducted a principal components analysis on the DAS-24 using data from 143 euthymic bipolar I participants. Scores were compared with data from 109 euthymic participants with a diagnosis of unipolar depression. Three factors were revealed; Goal attainment (beliefs about striving to have constant positive emotion, control over feelings, efficient problem-solving and the ability to excel), Dependency (the need to be validated by others) and Achievement (a need to achieve in order to be acknowledged). The bipolar group scored significantly higher than the unipolar depressed group on Goal Attainment when participants likely to be in a depressive episode were excluded from analysis. Furthermore, Goal Attainment scores correlated with number of past hospitalisations due to manic episodes and to bipolar episodes as a whole indicating that high Goal Attainment scores may be associated with vulnerability to mania. The BAS dysregulation model (discussed next) also postulates high goal striving as a risk factor for BD and so these results give support to the BAS dysregulation model.

In a more recent study, Perich, Manicavasagar, Mitchell and Ball (2011) found that people with euthymic BD scored significantly higher on the Dependency and Achievement subscales of the DAS than euthymic unipolar depressed and control participants when current mood was controlled. Additionally, bipolar participants scored higher than control (but not unipolar depressed) participants for Goal Attainment dysfunctional attitudes. However, in a comparative study of BD I and BD II with unipolar depression and healthy controls, Fletcher, Parker and Manicavasagar (2013) found that all clinical groups displayed more dysfunctional attitudes overall compared to controls and, regardless of current mood and anxiety, all clinical groups showed similar dysfunctional attitudes related to Achievement and Dependency. In contrast to previous findings (e.g. Lam et al., 2004), Goal Attainment scores did not differ between clinical groups. However, BD I scored significantly higher on

Goal Attainment compared to controls suggesting a cognitive style profile specific to BD I which could explain why people with BD I experience more extreme high moods (mania) than people with BD II.

Other studies have found no significant differences between remitted bipolar, remitted unipolar depressed and control groups in DAS scores (Alatqi, Crane, Williams & Goodwin, 2010; Wright, Lam & Newsom-Davis, 2005) and prospective research has revealed that negative cognitive styles were predictive of 6-month outcomes in quality of life and global functioning in unipolar depression but not BD (Jones, Twiss & Anderson, 2009). These mixed findings relating to dysfunctional attitudes in unipolar depression and BD highlight the need for a clearer distinction between the cognitive vulnerabilities associated with each clinical group.

1.3.1.3 Mood state dependency of dysfunctional attitudes

It has been suggested that dysfunctional attitudes may be mood state dependent. When only subthreshold levels of depression were reported by participants with remitted BD there was no evidence of dysfunctional attitudes (Lex, Meyer, Marquart & Thau, 2008). Additionally, when bipolar participants were in a manic phase dysfunctional beliefs were lower in BD than unipolar depression (Goldberg, Gerstein, Wenze, Welke & Beck, 2008) and bipolar participants currently in a (hypo)manic episode or who were euthymic showed lower levels of dysfunctional attitudes than participants in a current mixed/depressive episode (Reilly-Harrington et al., 2010). Similarly, following positive mood induction, Lomax et al. (2011) found that the number of dysfunctional completions on a sentence completion task based on the DAS scales reduced for both control and bipolar participants. These results suggest that dysfunctional attitudes may relate more to depression than mania (in contrast to some of the findings discussed above). Perhaps this conflict can be explained by conclusions based on a review of the evidence for both negative and positive cognitive styles

being related to BD (Johnson & Tran, 2007). This review concluded that negative cognitive styles were related to depression while increased goal focus and confidence were related to mania.

Noting the lack of prospective studies focussing on whether cognitive variables predict the course of BD, Johnson and Fingerhut (2004) studied 60 BD I participants and found that negative automatic thoughts predicted depression at 6 month follow-up but dysfunctional attitudes did not (despite being related to baseline depression). Neither negative automatic thoughts nor dysfunctional attitudes were related to mania at baseline or 6 month follow-up. In a more recent cross-sectional study negative cognitive biases in BD were found to relate to mood state rather than to vulnerability to BD (Jabben et al., 2012).

To further assess mood state dependency of dysfunctional attitudes in BD, Babakahni and Startup (2012) induced sad and happy mood states in 49 euthymic bipolar and 37 control participants. Following sad induction dysfunctional attitudes (in relation to Goal Attainment, Dependency and Achievement) in the bipolar group were elevated compared to happy induction, indicating a stronger association with low mood. Only Achievement dysfunctional attitudes were significantly elevated in BD compared to controls following both the happy and sad inductions. However, elevations in Goal Attainment attitudes may not have been revealed following positive induction because positive mood changes elicited were not strong enough. Additionally, elevated Achievement dysfunctional attitudes may also indicate a desire for increased positive mood which may be a consequence of achievement. This study was limited by a lack of DAS baseline scores which meant that differences pre-post mood induction and systematic group differences in DAS scores at baseline could not be verified.

Another study using a mood induction procedure found that dysfunctional attitudes in BD I were resilient to minor increases in mood (Wright et al., 2005). Remitted BD I, remitted unipolar depressed and control participants completed the DAS-24 before and after

positive mood induction. Compared to the other 2 groups, the bipolar group changed significantly less in DAS total score, and in Goal Attainment and Achievement attitudes relative to the unipolar group. Similarly, Alloy et al. (1999) reported that dysfunctional attitudes were stable across mood states in sample of 43 undergraduates meeting criteria for a subsyndromal mood disorder (i.e. cyclothymia, dysthymia, or hypomania) and using an indirect measure (i.e. sentence stem completion task based on the DAS scales), Thomas, Bentall, Knowles and Tai (2009) found that in all phases of illness (mania, depression, and remission) BD showed higher levels of dysfunctional attitudes compared to controls. Thus, rather than being mood state dependant all phases of BD were associated with dysfunctional attitudes. Taken together these results suggest that dysfunctional attitudes may actually represent a trait rather than state in BD. Again, there are mixed findings related to the mood state dependency of dysfunctional attitudes highlighting the need for more research.

1.3.1.4 Dysfunctional attitudes and life events

Beck's cognitive model suggests that the dysfunctional attitudes discussed are triggered by life events. Indeed, Reilly-Harrington et al. (1999) found that negative life events and dysfunctional attitudes predicted depressive and manic symptoms at 1 month follow-up. However, Alloy et al. (1999) reported that while a negative attribution style (as measured by the Attributional Style Questionnaire ASQ; Peterson et al. 1982; Seligman, Abramson, Semmel & von Baeyer, 1979) and negative life events predicted depression (and a positive attribution style coupled with a positive life event predicted hypomania), an interaction between dysfunctional attitudes and negative life events did not. In a more recent review related to life events as predictors of bipolar symptoms, Johnson (2005) concluded that negative life events were associated with increases in depression but not mania. Rather, mania was triggered by life events involving goal attainment (Johnson et al., 2008). Thus, the types of life events that trigger depression and mania need to be distinguished and more

work is needed to examine which measures (e.g. DAS/ASQ) are most predictive of bipolar symptoms in interaction with life events.

1.3.1.5 Summary

Results from the research discussed suggest that people with BD share negative cognitive styles with people with unipolar depression but that mania should not be viewed as a polar opposite of depressed mood. Thus, evidence to date does not support Beck's original dichotomous framework. His model cannot comment on more complex mood states such as mixed episodes and it remains unclear whether dysfunctional attitudes represent a trait or state-like phenomena due to mixed findings relating to the mood state dependency of dysfunctional attitudes. More longitudinal studies are needed to clarify how different types of life events predict symptoms of depression and mania over time. Additionally, more research is needed to distinguish between BD and unipolar depression to understand mania within this framework and to clarify the directionality of dysfunctional attitudes better i.e. whether dysfunctional attitudes held by people with BD are a cause or effect of the disorder. Beck's cognitive model proposes a linear relationship between cognition and emotion (cognition causes emotion) but emotions in detail, thus limiting its utility when discussing an affective disorder.

1.3.2 The Behavioural Activation System (BAS) dysregulation model

1.3.2.1 The Behavioural Inhibition (BIS)/BAS model

In his theory of anxiety, Gray (1976; 1982) identified two key brain systems associated with the regulation of emotion, namely the Behavioural Inhibition System (BIS) and the Behavioural Activation System (BAS). He suggested that the BIS regulates behavioural inhibition in the presence of stimuli that have been conditioned to punishment, non-reward or novel stimuli. Behavioural inhibition prohibits engagement in behaviours that

may lead to pain or negative consequences and BIS activity is, therefore, associated with withdrawal behaviours and negative affect (e.g. feelings of anxiety, frustration, anger and sadness) in response to related cues. According to Gray, the BAS regulates approach motivation, approach behaviour and positive affect in the presence of positive/reward or punishment avoidance cues. Activity in the BAS promotes movement towards, or increases in, goal attainment and is associated with positive feelings (e.g. hope, happiness and elation).

Carver and White (1994) developed the BIS/BAS scales to assess sensitivity in these two neuropsychological systems. The BIS/BAS measure includes 3 subscales; BAS-Drive (motivation to pursue goals); BAS-Reward Responsiveness (reactions to incentives); BAS-Fun Seeking (desire for excitement and approach); and Behavioural Inhibition. Carver and White (1994) considered the BAS to be related to positive affect and the BIS to negative affect, and neither to be related to the alternative affect. Thus, people with high BIS sensitivity should experience more negative affective symptoms in the face of punishment cues, while people with high BAS sensitivity should respond with more positive affect to reward cues. At the extremes, people with high BIS sensitivity may respond with depressive symptoms, and people with high BAS sensitivity may respond with hypomanic symptoms when presented with relevant stimuli.

A number of studies using student samples have found self-reported BIS was positively correlated with depressive symptoms (Meyer, Johnson & Carver, 1999; Meyer, Johnson & Winters, 2001) and lifetime depression (Johnson & Carver, 2006) and negatively correlated with hypomania (Fulford, Johnson & Carver, 2008; Jones & Day, 2008). People with BD I, BD II and unipolar depression have also been found to display an overactive BIS compared to controls (Fletcher et al., 2013). However, other studies have failed to find predicted links between self-reported BIS and depression (Johnson, Turner & Iwata, 2003; Jones & Day, 2008). Further, there are discrepancies regarding the predictive utility of the BIS for depression. Meyer et al. (2001) found that higher BIS scores did not predict

depression over time in a student sample while Alloy et al. (2008) found that increased BIS sensitivity predicted a shorter time to depressive episodes in a prospective study of BD II and cyclothymic participants.

1.3.2.2 The BAS dysregulation model

Despite some rather tentative evidence that the BIS is linked to depression, much of the research regarding neuropsychological system dysregulation in BD has focussed on dysregulations associated specifically with the BAS. The BAS dysregulation model originally proposed by Depue and Iacano (1989), and more recently expanded by Urosevic, Abramson, Harmon-Jones and Alloy (2008) to include specific psychological processes involved in BAS dysregulation, suggests that in BD depressive and manic phases can be viewed as opposite extreme manifestations of BAS activity. Depue and Iacono (1989) argue that BAS activity is low in depression and high in mania. In depression, an inactive BAS fails to produce positive affect of incentive-reward motivation, while in mania an overactive BAS produces excessive incentive-reward motivation. The key to the BAS dysregulation theory is that people with BD have a biological vulnerability resulting from dysregulation of a neurobiological motivational system responsible for the regulation of responses to events that signal the opportunity to gain or lose rewards. Following an environmental cue (event) two appraisal processes take place. Firstly, one appraises the event as BAS-relevant i.e. relevance to the rewards one seeks (relevance appraisal); then one appraises how likely it is he/she will gain the reward (efficacy appraisal). These appraisals lead to a post-event BAS state. An example of how this theory would explain the onset of a depressive episode is described; following an unsuccessful job interview (environmental cue) one appraises the event as BAS-relevant and appraises efficacy to be low i.e. he/she is unlikely to obtain reward/goal of an interesting career. This leads to depressive symptoms in BD, due to the weak regulatory strength of the BAS. In summary, individuals vulnerable to BD have more sensitive regulatory systems

leading to increased vulnerability to mood variation. Hypomania/mania is suggested to correspond to high levels of BAS activity and depression to low levels of BAS activity (Depue & Iacono, 1989; Urosevic et al., 2008).

1.3.2.3 BAS sensitivity and vulnerability to hypo(mania)

Meyer and colleagues have provided support for a link between BAS sensitivity and vulnerability to hypo(mania) but have found conflicting results regarding the relationship between specific BAS subscales most related to manic vulnerability in student samples. In a large sample of undergraduate students Meyer et al. (1999) utilised Carver and White's BIS/BAS scales and found that higher BAS Fun Seeking scores related to manic symptoms and lower BAS Reward Responsiveness in people at risk for mood disorders. Further, vulnerability to mania was linked to increased approach motivation even when goal attainment was difficult (Meyer, Beevers, Johnson & Simmons, 2007). In addition to the BAS sensitivity predicting levels of mania and of positive affect, Meyer and Hofmann (2005) found that BAS sensitivity also predicted fluctuations of mania. However, in a later study of both cross-sectional and prospective associations between self-reported BIS/BAS and mania and depression in 59 BD I participants (96% of whom were experiencing an episode), Meyer et al. (2001) failed to find a correlation between BAS scales and manic symptoms. However elevated BAS scores (particularly Reward Responsiveness) did predict increased manic (but not depressive) symptoms over time. Thus, BAS sensitivity may increase vulnerability to mania in BD. Similarly, in a more recent prospective study (Alloy et al., 2008) BAS scores predicted a shorter time to hypomanic episodes in bipolar spectrum disorder (BD II, cyclothymia). In this study BAS scores at baseline *were* higher in bipolar spectrum participants compared to controls which contrasts earlier reports of no difference between bipolar and control groups on the BIS/BAS scales (Jones, Tai, Evershed, Knowles & Bentall, 2006a).

Other studies have highlighted the importance of BAS Drive and Fun Seeking in (hypo)mania. In an undergraduate sample, Fulford et al. (2008) found that vulnerability to hypomania correlated with the Drive and Fun seeking BAS scales but not Reward Responsiveness and Van der Gucht, Morriss, Lancaster, Kinderman and Bentall (2009) found bipolar participants in a manic state scored higher than the controls on BAS Drive and Fun Seeking compared to bipolar participants in a mixed, depressive or euthymic state and healthy controls.

In contrast to Alloy et al. (2008) and Meyer et al. (2001) who found BAS Reward Responsiveness predicted time to hypomania, and Jones, Shams and Liversidge (2007) who observed a relationship between Drive and hypomanic personality, Jones and Day (2008) found that neither BAS Reward Responsiveness nor Drive subscales were specifically associated with hypomanic personality. Rather, higher BAS Fun Seeking and lower BIS scores predicted hypomanic personality while BAS Reward Responsiveness was negatively predictive of depressed mood.

Studies involving adolescents have also reported conflicting findings regarding BAS activity in mania. Gruber et al. (2013) measured adolescent self-reported and parent-reported BIS/BAS activity using the BIS/BAS scale in a sample of 425 adolescents with remitted and episodic bipolar spectrum disorders (20%) and unipolar depression (37%), disruptive disorder (34%) and a residual disorder (8%). They found that symptoms of mania predicted parent-reported BAS and symptoms of depression predicted parent and adolescent-reported BAS. Furthermore, parent BIS/BAS reports were stronger predictors for manic symptoms compared to adolescent self-reports. In contrast, Biuckians, Miklowitz and Kim (2007) found that adolescents who scored higher on the BAS scale reported less severe manic symptoms in a sample of subsyndromal adolescents diagnosed with BD I, BD II or BD NOS. BAS sensitivity was not associated with current symptoms of depression and increased

BIS scores correlated with increased anxiety scores. Gruber et al. (2013) suggested that perhaps adolescent reports were less accurate measures of mania than adult reports.

There is a general lack of studies focusing on bipolar subtypes, rather previous research has examined BD I disorder or bipolar spectrum disorders. Using the BIS/BAS scales, Fletcher et al. (2013) examined cognitive styles and BAS activation in BD I and BD II compared to unipolar depression and healthy controls. Bipolar and unipolar groups differed on BAS subscales, supporting the BAS dysregulation theory of BD. The bipolar group differed from the other groups on BAS Reward Responsiveness only and BD I scored higher than BD II on the Drive subscale only suggesting BD I have greater persistence in reward pursuit than BD II. Further, BAS-Reward Responsiveness sub-scale was not correlated with current mood/anxiety symptoms suggesting that the BAS represents a trait-like characteristic that is relatively independent of current symptomatology.

1.3.2.4 BAS sensitivity and vulnerability to BD

Using a behavioural high-risk design in which participants were selected on the basis of hypothesised psychological vulnerability to BD, Alloy et al. (2006) examined whether self-reported BAS sensitivity (BIS/BAS scales) predicted lifetime bipolar spectrum disorders. Participants with high BAS sensitivity (HBAS) were 6 times more likely to have a lifetime bipolar spectrum diagnosis compared to participants with medium BAS sensitivity (MBAS) but there were no group differences in the likelihood of a unipolar depression diagnosis. Thus, high BAS sensitivity may specifically relate to risk for bipolar disorders. Participants with higher BAS sensitivity also displayed significantly higher impulsivity and marginally higher proneness to hypomanic symptoms. With regard to depression, there were no differences between BAS groups in proneness to depressive symptoms, rather high BIS sensitivity was associated with proneness to, and current, depressive symptoms. However, this study was limited by its retrospective design.

More recently Alloy et al. (2012) used a prospective behavioural high-risk design and found that HBAS participants had a greater likelihood, and shorter time to onset, of bipolar spectrum disorders than MBAS participants across an average of 12.8 months of follow-up when controlling for baseline mood symptoms and family history. On a behavioural task, first onset of bipolar spectrum disorder was predicted by high Reward Responsiveness and ambitious goal-striving for popular fame and financial success as measured by the Willingly Approached Set of Seriously Unrealistic Plans (WASSUP; Johnson & Carver, 2006). Thus, increased BAS sensitivity indicates a vulnerability factor for both initial onset and a more severe course of bipolar spectrum disorder. These results are consistent with earlier studies (Fulford et al., 2008; Gruber & Johnson, 2009; Johnson & Carver, 2006) that have found hypomanic vulnerability related to unrealistically ambitious goal setting according to the WASSUP. Interestingly, Johnson and Carver (2006) found a negative relationship between the WASSUP and depression while Gruber and Johnson (2009) found no significant relationship.

1.3.2.5 Goal attainment and incentives

Given that the BAS is postulated to be a brain system responsible for regulating goal directed activity, Johnson et al. (2000) examined whether life events involving goal attainment (rather than just positive life events) would promote manic symptoms in 43 manic, depressed and mixed episode BD I participants. They found that manic symptoms increased following goal-attainment events, but depressed symptoms remained unchanged. That fact that neither goal-attainment nor positive life events were associated with changes in depression suggests the association of the BAS to BD is polar specific.

Johnson and colleagues (2008) replicated these results in a prospective study of 125 people with BD I (4 of whom were euthymic on study entry). Over an average of 27 months manic symptoms were predicted by goal-attainment life events rather than positive events

in general. In a sample of 460 students Meyer et al. (2004) found that current hypomania symptoms or positive affect were associated with a tendency to construe goals in an overly optimistic manner. Similarly, history of mania, but not history of depression, was found to relate to higher expectations of achieving popular fame and wealth in students diagnosed with bipolar spectrum disorders (Johnson, Eisner & Carver, 2009).

Further, Nusslock, Abramson, Harmon-Jones, Alloy and Hogan (2007) found that the act of goal striving (preparing for and competing exams) was also associated with increased hypomanic symptoms (inflated self-esteem/grandiosity, decreased need for sleep, distractibility and increased goal-directed activity/psychomotor agitation) but not depressive episodes or symptoms in a sample of college students diagnosed with BD II or cyclothymia. No hypomanic episodes or symptoms were experienced by control participants during either the baseline or exam period. In the bipolar spectrum group, high BAS sensitivity (total BAS scale) according to self-reports on the BIS/BAS scale was associated with increased hypomanic symptoms (specifically inflated self-esteem/grandiosity and increased goal-directed activity/psychomotor agitation) during exams but did not moderate the likelihood that participants would develop bipolar spectrum episodes during a goal-striving event. Similarly, Johnson and Carver (2006) found lifetime vulnerability to mania related to intense goal pursuit when controlling for current symptoms and lifetime depression while there was no association between depression (lifetime or current symptoms) and high goal setting.

In a daily diary study of euthymic BD I and control participants, Wright, Lam and Brown (2008) found that increases in behavioural engagement were associated with higher levels of perceived reward, whereas decreases in behavioural engagement were associated with higher levels of perceived frustration in both groups. Although there were no group differences in time taken to recover to baseline levels of BAS activity following reward, history of mania was associated with prolonged activation following reward, whereas history of both mania and depression were associated with prolonged recovery following

frustration. Wright et al. (2008) proposed that a history of manic episodes may directly affect BAS dysregulation through psychological scarring or perhaps the experience of multiple episodes of either mania or depression leads to a vulnerability associated with the related polarity.

1.3.2.6 The utility of the BIS/BAS scale and neuropsychological studies

Despite being based on a theoretical framework, the BIS/BAS scales were not designed to assess dysregulation in the BIS and BAS, rather they were developed to "assess individual differences in personality qualities that reflect the sensitivity of two physiological self-regulatory systems" (Carver & White, 1994 p. 330). Noting the lack of a self-report measure to assess BAS dysregulation independently from inter-individual differences in BAS sensitivity, Holzwarth and Meyer (2006) developed a scale to specifically assess BAS dysregulation (DYS scale). They found that people at risk for BD showed a trend towards evaluated scores on the DYS scale yet did not score higher on the BAS scale. This group did, however, score higher on the BIS scale and, given the mixed findings discussed earlier, this sample may not be truly representative.

The inconsistencies reported regarding BAS sensitivity using the BIS/BAS scales may be due to using a self-report measure to study a neuropsychological model. Indeed, there is evidence that that BIS/BAS scales originally developed with undergraduate samples do not adequately assess behavioural activation in clinical samples. Hayden et al. (2008) used multiple measures of BAS sensitivity to compare BAS activity in BD with healthy controls. Interestingly, they found that patterns of BAS activity differed depending on the methodology used. Following a behavioural task (card sort) indicating reward sensitivity, euthymic bipolar participants displayed higher BAS activity than participants in a mood episode or controls. In contrast, currently episodic bipolar participants showed greater left anterior cortical activity compared to euthymic and control participants according to

electroencephalography (EEG) patterns following a mood induction procedure designed to elicit BAS activity.

Harmon-Jones and Allen (1997) examined the motivational response tendencies of the BIS and BAS systems using EEG and found that resting frontal EEG asymmetry (greater left- than right-frontal cortical activity) related to approach motivation (BAS). In contrast, the BIS was not related to resting frontal EEG asymmetry. Based on this finding that left frontal cortical region was involved in approach motivation Harmon-Jones et al. (2008) later tested the hypothesis that people with BD would show an increase in approach motivation during reward striving compared to controls using EEG. This hypothesis was supported. People with bipolar spectrum disorders showed greater frontal cortical asymmetry during difficult but potentially rewarding tasks compared to controls, suggesting that increased left frontal activity triggered by difficult but rewarding goals may be involved in mania. In a more recent prospective study Nusslock et al. (2012) found that left-frontal EEG activity at baseline was significantly elevated in bipolar spectrum individuals in a hypomanic episode and also predicted a greater likelihood of converting from cyclothymia or BD II disorder to BD I disorder over the 4.7-year follow-up period. Thus, frontal cortical activity may serve as a useful neurophysiological marker to indicate vulnerability to mania.

Caseras, Lawrence, Murphy, Wise and Phillips (2013) examined reward activity in the ventral striatum in euthymic BD I and II participants and healthy controls. They found that all participants displayed ventral striatal activity during reward anticipation and the magnitude of ventral striatal activity was positively correlated with the Fun Seeking scale across all groups. However, BD II participants showed significantly greater activity than the other 2 groups despite no group differences being identified using the BIS/BAS scales. Interestingly, during positive outcome, BD I displayed significantly greater ventral striatal activity than BD II participants. Thus, people with BD II may have increased sensitivity to reward anticipation while people with BD I have increased sensitivity to reward receipt.

1.3.2.7 Summary

Evidence proposed based on the BAS dysregulation model suggests that pre-event BAS regulatory strength is biologically different in people with BD (i.e. increased BAS sensitivity) compared to controls and emphasises the importance of environmental cues (i.e. events) in the course to a full-blown mood episode. It is generally accepted that BAS sensitivity is associated with vulnerability to mania in BD (for a review see Johnson, Edge, Holmes & Carver, 2012) and a number of studies provide support for this notion. However, there are a number of limitations to this model. Using the BIS/BAS scales, there have been inconsistent findings regarding the subscales most relevant to mania vulnerability. Caution should still be paid to the use of a self-report measure (BIS/BAS scale) to examine a neuropsychological theory. However, support for the BAS dysregulation theory also comes from prospective (Alloy et al., 2006; 2008; 2012) and neurobiological studies (Caseras et al., 2013; Harmon-Jones & Allen, 1997; Harmon-Jones, 2008; Nusslock et al., 2012). There is still a need for more prospective studies of BAS sensitivity in BD and a clearer explanation of transition to depression in BD. Less research has focussed on the role of the BAS in depression and studies that have, report inconsistent correlations between BAS scores and depressive symptoms. Additionally, the role of the BIS is not included in the BAS dysregulation theory despite some evidence of a link between BIS sensitivity and depression in BD.

1.3.3 The Interacting Cognitive Subsystems (ICS) approach

1.3.3.1 The original ICS

The ICS proposed by Teasdale and Barnard (1993) was originally developed to understand cognitive processing in unipolar depression. The ICS is a multi-level, multi-system approach to describing information processing in which the relationship between cognition and emotion is complex and interactive. There are 9 main cognitive subsystems within the ICS. These are the acoustic and visual subsystems (sensory related), the morphonolexical,

propositional, implicational and object subsystems (central) and the articulatory, body state and limb subsystems (affector). Information is processed through these subsystems partly in parallel and partly sequentially depending on the type of task and other requirements acting on the overall system. The propositional and implicational subsystems are those that are particularly important in the generation of emotion. Within the propositional subsystem representations are held in the form of propositions, which are the smallest semantic units that can have a truth value. Meanings at this level are explicit, simple and correspond to the kind of meaning conveyed by a single sentence. In contrast, at the implicational level, representations are implicit, more complex and cannot be easily conveyed by language alone. These representations are called schematic models. Information fed into the implicational subsystem from other subsystems informs the generation of schematic models.

There are 3 possible inputs into the implicational subsystems; from the visual, body state and propositional subsystems and these four subsystems are the most important in the generation of emotion (Figure 2). In depression, propositional processing regenerates negative self schemas at the implicational level, which in turn regenerate further negative propositions about the self. Input from the body state subsystem reinforces the negative schematic model and a negative feedback loop is formed. Thus, the products of processing propositional meaning and sensory information (e.g. visual and body state information) combine to generate schematic models (implicational representations). This level of representation is the only level that can directly produce emotion.

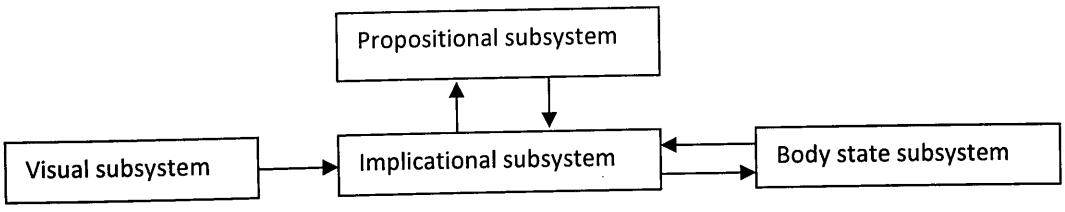


Figure 2: Four key subsystems of the ICS involved in the generation of emotion.

1.3.3.2 The ICS and BD

Bernard (2004) adapted the ICS to explain BD. He suggested that in depression, schematic models continually generate negative propositions because the implicational and propositional systems enter a state of interlock. Negative propositions then feedback into the implicational system and regenerate the schematic model. In mania, schematic models have a high rate of change (in contrast to the 'interlock' in depression) and positive schematic models are processed with little evaluation of propositional representations, thereby remaining outside of focal awareness. New schematic models may be formed from partial products of fast changing schematic models and this can lead to imaginative thinking and in extreme circumstances, delusions.

Lomax and colleagues have used the ICS model as a basis for examination of BD but there have been few similar attempts. Lomax, Barnard and Lam (2009) used a Question-Answer task (Palmer & Bernard, 2003) to examine the mode of processing of schemas in euthymic BD and healthy controls before and after positive mood induction. Although mood induction did not alter processing from propositional to implicational as hypothesised, the bipolar group were more likely than controls to answer questions consistent with implicational schema pre- and post-mood induction. These results suggest that people with BD tend to operate at a more abstract level of representation (implicational level). Lomax et al. (2009) suggested that when operating at an abstract level people with BD tend to incorporate conflicting information into schemas rather than reconciling differences which may increase vulnerability to mood episodes.

In a more recent study Lomax and Lam (2011) examined propositional and implicational level operations in a sample of euthymic BD I and control participants using a sentence completion task based on Teasdale, Taylor, Cooper, Hayhurst and Paykel's (1995) study of depression but adapted for use pre- and post- positive mood induction. They found that dysfunctional schematic models (implicational level) were expressed by the completion

of sentence stems by negative constructs (propositional level), thus positive mood induction reactivated cognitive patterns in BD that were likely to maintain affective disturbance.

1.3.3.3 Summary

The ICS has been criticised (Power, 2005) for being overly focussed on cognitions while and not paying enough attention to emotions. Due to a lack of studies investigating the ICS in relation to BD, it remains to be seen how empirically and clinically useful this model is for understanding BD. Further research is needed to ascertain whether this multi-level, multi-system framework can be applied in clinical settings or whether it provides a more descriptive than explanatory theory of BD.

1.3.4 The Schematic, Propositional, Analogical and Associative Representational Systems (SPAARS) model

1.3.4.1 The original SPAARS model

In Power and Dalgleish's (1997) SPAARS model (Figure 3) internal/external events are first processed through the analogical system, which incorporates an olfactory, auditory, gustatory, visual, proprioceptive and tactile modality. Information processed through these modalities forms a representation which is not reliant on language for meaningful interpretation. Output from the analogical system then feeds into 3 representation systems that operate in parallel, namely the associative level (lowest), propositional level (intermediate) and the schematic model level (highest) of processing. At the *associative level* of representation emotional output is usually the function of repetition of event-emotion pairing (however, a number of factors can facilitate the association process e.g. salience/trauma). When an event is repeatedly paired over time with a schematic interpretation and its associated emotions, it can become linked directly to emotion, negating the need for appraisal via the schematic model level. The *propositional level*

consists of entities that represent beliefs, ideas, objects and concepts, and the relations between them in a non-language specific way. Although language-free, their meaning can be captured by statements in natural language. No direct emotional outputs occur via the propositional level. However, propositions can feed either through appraisals at the schematic level or directly through the associative route. The *schematic model level* is the highest level of representation. It contains higher-order, abstract information (concerning the self, the world and others) that cannot be fully expressed by natural language. Information from the propositional and analogical systems feed into the schematic model level to generate an interpretation, which then evokes emotion. Interpretations held at this level are modified in the light of new information from the other systems and information is outputted from the schematic model level across the other systems. Thus, the schematic model level has an influential role over the whole system. Furthermore, if a particular schema held within this level is predominant at a given time, information processed through the other systems will be influenced. As outlined, there are two routes by which emotion can be outputted; through the schematic model level or the associative level. The presence of two routes indicates that it is possible to have conflicting emotions generated at different levels.

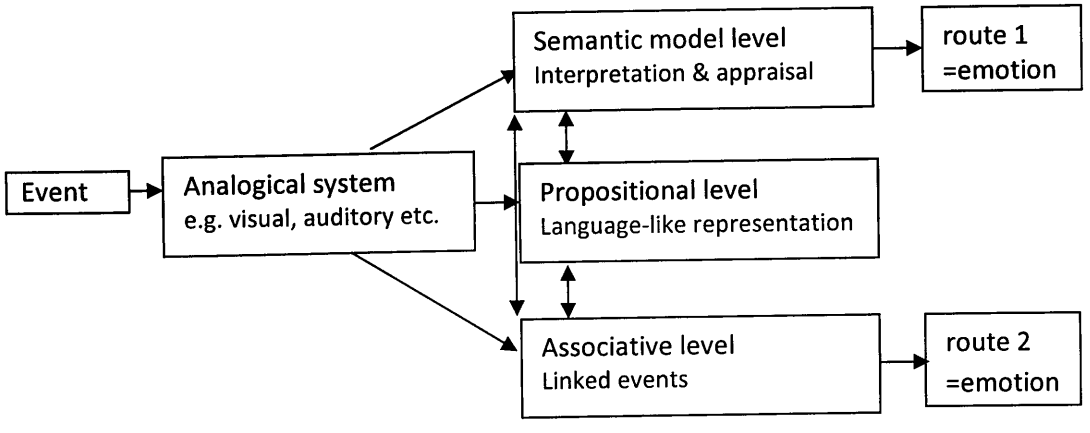


Figure 3: Power and Dalgleish's (1997) SPAARS model of emotion

1.3.4.2 SPAARS and BD

Jones (2001) applied the SPAARS model to mania in BD (Figure 4), suggesting that the analogical system can become disrupted through circadian rhythm disruption (e.g. insomnia, jetlag, drug/alcohol use, and daylight changes) and interpretation of this disruption may increase vulnerability to BD (Healy & Williams, 1989; Jones, 2001). This appeared to be an attempt to link this complex theoretical account to what is known about BD (i.e. increased circadian instability; see Jones 2006 et al., 2006b), however there has been a general lack of similar attempts. Jones (2001) suggests that analogical system disruption feeds into the other three levels. At the schematic model level, a positive model of hypomania may set up and amplify positive feedback loops through the system. At the associative level, automatic appraisals and biases learned from previous experiences feed into the creation and appraisal of future experiences. At the propositional level, propositions such as 'I feel good, creative, attractive...' form part of the positive feedback loop that maintains and amplifies the initial change at the analogical level (i.e. circadian disruption). In situations of ongoing psychological disturbance such as anxiety or depression, the system can become stuck.

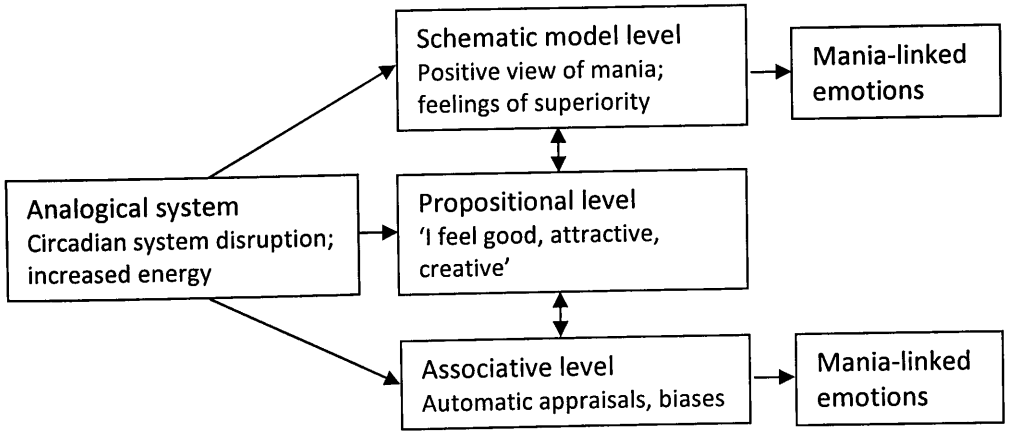


Figure 4: Jones' (2001) adaptation of the SPAARS model for BD

The SPAARS model can be applied to normal emotions, suggesting that there are psychological processes that we all use, but that these processes can become disrupted/stuck in BD (see Power & Schmidt, 2004, for a review of SPAARS in relation to therapy and mood disorders). Few studies have used the SPAARS model in its entirety as a basis for examining emotion BD (for an exception see Carolan and Power, 2011). Carolan and Power (2011) specifically aimed to test the emotional aspects of the SPAARS using a cross-sectional design to explore emotional differences within and between euthymic bipolar, unipolar depressed and control groups. The SPAARS proposes that there are five basic emotions (sadness, happiness, anger, fear and disgust), which form the basis for all emotional experiences and that the coupling of two or more of these emotions provides the basis for both normal and disordered emotional experience. Carolan and Power (2011) found that multiple emotions were generated simultaneously through the schematic and associative routes to emotion. Specifically, hypomania was characterised by the emotional coupling between happiness (schematic level) and anger/fear (associative level) while depression was characterised by coupling between sadness (schematic level) and disgust (associative level). These results provide some support for the clinical validity of the SPAARS to BD.

1.3.4.3 Self-dispositional hypomanic appraisals

The Hypomanic Interpretations Questionnaire (HIQ; Jones, Mansell & Waller., 2006a) was developed to measure the tendency for people to make personal attributions for hypomanic relevant experiences (e.g. "If I felt impulsive, I would probably think it was because I could make rapid decisions and good choices") which may result from circadian rhythm disruption. A number of studies have found that people with BD (and those at risk for BD) scored significantly higher on the HIQ than a matched non-clinical sample when

controlling for mood symptoms (e.g. Jones et al., 2006a; Jones & Day, 2008; Mansell & Jones, 2006).

In a cross-national sample of 638 students, factor analyses of measures of cognitive styles (including the HIQ) suggested that vulnerability to mania specifically related to positive interpretations of manic symptoms as well as acting before thinking, being overly confident in response to success, and tendencies to dampen positive affect (Johnson & Jones, 2009).

A recent study (Dempsey, Gooding & Jones, 2011) of positive and negative appraisals and rumination in a sample of 353 analogue participants found that vulnerability to hypomania was primarily associated with a positively orientated cognitive style according to responses on the HIQ, Interpretations of Depression Questionnaire (IDQ; Jones & Day, 2008), Responses to Positive Affect Scale (RPA: Feldman, Joormann & Johnson, 2008) and Ruminative Responses Scale (RRS: Nolen-Hoeksema & Morrow, 1991). Specifically, scores on the hypomanic self-appraisal, reflective negative rumination, and self-focused positive rumination measures were associated with vulnerability to hypomania. Thus, following positive experiences people vulnerable to hypomania may engage in cognitive styles that are likely to exacerbate initial positive mood and lead to increased risk of a hypomanic episode.

Using actigraphy and self-reports to measure sleep and circadian rhythms in at-risk and control groups, Ankers and Jones (2009) found that people vulnerable to BD made more positive self-appraisals than controls. Further, high-risk participants had more variable sleep patterns, shorter sleep duration and later, more variable, bedtimes. Both positive self-appraisal and variability in bedtime predicted group when controlling for current mood. These results provide support for both increased self-dispositional hypomanic appraisals and variability in circadian rhythms as important factors associated with vulnerability to BD, as does data from studies of individuals with BD (Jones, Hare & Evershed, 2005) and children of bipolar parents (Jones et al 2006b). However, in a more recent familial high-risk study of adolescents at high-risk of BD (with a parent with BD) and adolescent controls, Espie, Jones,

Vance & Tai (2012) found that despite a trend for high-risk adolescents to make more self-dispositional positive appraisals, there were no significant group differences on any of the self-report measures regarding appraisal styles (ASQ; Peterson et al., 1982 and HIQ) or on a measure of risk for BD (the Hypomanic Personality Scale; Eckblad & Chapman, 1986). However, self-dispositional hypomanic appraisals were predicted by high HPS scores. More research is needed with larger samples to further assess familial risk and cognitive biases in BD.

1.3.4.4 Summary

Although the SPAARS model provides a complex theoretical model of BD, which can potentially improve understanding and inform treatment pathways, few studies have tested its entire framework in relation to BD (perhaps due to its complexity). Rather, research has focussed on appraisal styles that may increase risk for hypomania and a number of studies have found support for the notion that self-dispositional hypomanic appraisal styles are associated with BD. Although the SPAARS model is able to account for normal emotional experiences as well as disordered ones and focussed on both emotions and cognitions, it still requires a more testable version and some further explanations for it to be useful in research and practice. Specifically, research is needed to ascertain why the route through the model differs for people with and without BD; how specific the SPAARS is to BD (by including psychiatric control groups in investigations); how self-dispositional hypomanic appraisals impact on the development of mania longitudinally; and how depression develops and is maintained.

1.3.5 Integrative Cognitive Model (ICM)

Mansell, Morrison, Reid, Lowens, & Tai (2007) proposed a cognitive model of BD, highlighting the importance of interpretations regarding changes in internal state. The ICM

suggests that, in attempting to regulate mood, people with BD apply extreme personal meanings to internal states, which provoke exaggerated efforts to control these states. Such efforts exacerbate the initial internal state change, resulting in a vicious cycle (see Figure 5).

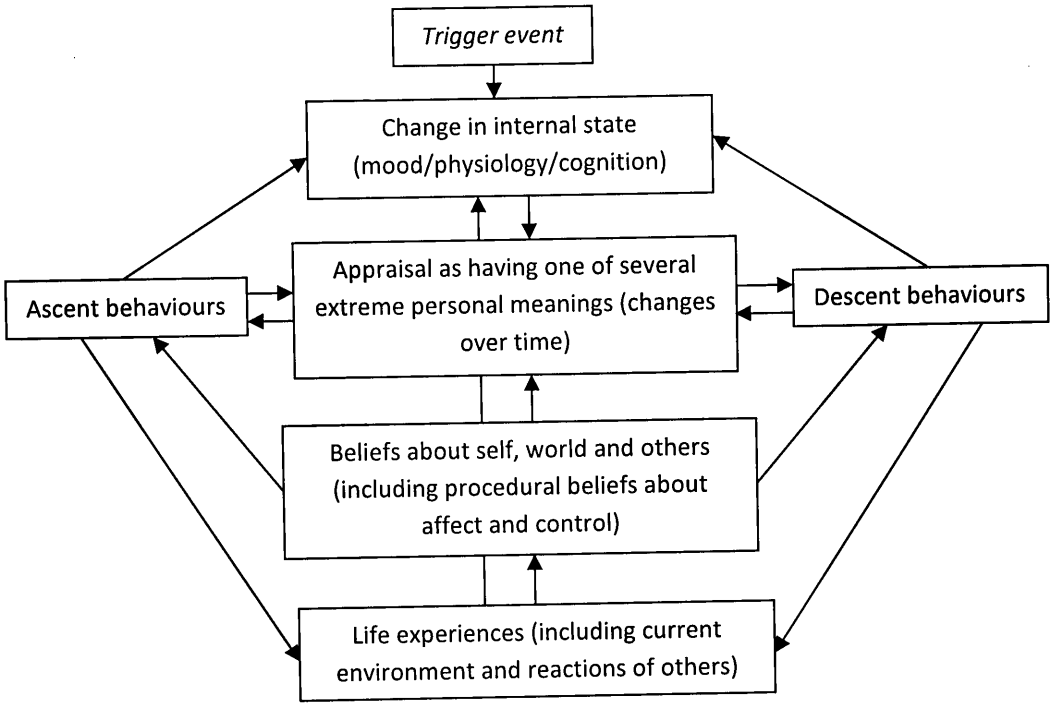


Figure 5: Mansell et al.'s (2007) cognitive model of mood swings in BD

1.3.5.1 A change in internal state

Firstly, a change in internal state is experienced following a trigger event. Changes in mood (e.g. feeling happy), physiology (e.g. increased energy) or cognition (e.g. racing thoughts) are classified as changes in internal state. Mansell et al. (2007) suggest that prior to a mood episode, people with BD will experience fluctuations in internal state.

1.3.5.2 Interpretation of a change in internal state

Once identified, a change in internal state is then interpreted in a way that implies extreme positive or negative personal meaning e.g. imminent catastrophe, a personal success, or a personal weakness. These appraisals have an influencing role over the whole system as they direct behavioural coping responses, which are also appraised. States of high

and low activation are associated with extreme personal appraisals and these appraisals can be multiple and conflicting.

Evidence of the appraisals proposed by Mansell et al. (2007) comes from research based on the Hypomanic Attitudes and Positive Predictions Inventory (HAPPI; Mansell, 2006). The HAPPI was developed to measure the extreme, personal positive and negative appraisals of internal states central to ICM. The original HAPPI (Mansell, 2006) consists of 5 categories: self-activation (overly positive self-relevant appraisals of activated states), self-catastrophic (overly negative appraisals of self-relevant internal states), other-positive (overly positive beliefs about perceptions of others), other-negative (overly negative beliefs about others and interpersonal relationships) and response-style (beliefs regarding potential response to internal states). Principal components analyses with student samples have revealed a similar pattern of item loadings (Dodd, Mansell, Sadhnani, Morrison & Tai, 2010; Mansell, Rigby, Tai & Lowe, 2008) and a more recent factor analysis study (Dodd, Mansell, Morrison & Tai, 2011d) of the extended HAPPI (Dodd et al., 2010) revealed considerable overlap with these previous studies (Dodd et al., 2010; Mansell et al., 2008). Dodd et al. (2010) identified 6 categorises of belief about internal states: Social Self-Criticism, Increasing Activation to Avoid Failure, Success Activation and Triumph Over Fear, Loss of Control, Grandiose Appraisals of Ideation, and Regaining Autonomy. Preliminary evidence has been found for the predictive validity of the HAPPI in a clinical sample (Dodd, Mansell, Morrison & Tai, 2011c) and people with BD have been found to score higher on the HAPPI than matched non-clinical and unipolar samples, while controlling for current symptoms (e.g. Alatqi 2010; Mansell, 2006; Mansell & Jones, 2006; Mansell et al., 2011). Interestingly, Kelly et al. (2011) found that individuals were most likely to have BD (rather than unipolar depression or no psychiatric diagnosis) when they endorsed *both* extremely positive and extremely negative appraisals of the same activated internal state. The authors suggested that these conflicting appraisals may lead to conflicting attempts to regulate mood and increase risk of relapse in

BD. A number of studies have also reported an association between scores on the HAPPI and analogue bipolar symptoms (Dodd et al., 2010; Dodd, Mansell, Bentall & Tai, 2011a; Dodd, Mansell, Morrison & Tai, 2011b; Dodd et al., 2001d; Dodd, Mansell, Beck & Tai, 2013; Mansell et al., 2008).

1.3.5.3 Coping responses: Ascent and descent behaviours

Immediate efforts at exerting control (i.e. coping responses) are triggered by appraisals of internal states as having extreme personal meaning. Coping responses are conceptualized as either 'ascent' or 'descent' behaviours.

Ascent behaviours (e.g. increased involvement in activities, risk-taking, alcohol and substance use, extended wakefulness, seeking social stimulation and dismissal of attempts by others to moderate behaviour) increase the activation level of the internal state and escalate symptoms. For example, someone who feels 'sped up' and believes this is because they are in good spirits and can take on new challenges is likely to engage in more activities and projects and ignore negative feedback from other people (this is also predicted by the HIQ; Jones et al. 2006a and therefore comparable to proposals in the SPAARS). As an individual takes on and completes new challenges, the initial appraisal is confirmed; "I am successful and others are too slow/incompetent". Thus, social cues that would normally moderate behaviour are ignored. Mansell and Lam (2006) found that following positive mood induction, people with BD used less advice to inform their decisions than controls and people with remitted unipolar depression. More recently, Wade, Wigg and Mansell (2012) found that people at risk for BD tended to ignore advice more often following positive mood induction and take advice more often following negative mood induction. If advice from others was attended to, this would assist in moderating a change in mood according to social context.

Descent behaviours (e.g. social withdrawal, extended sleep, rumination and self-critical thinking) decrease activation levels, contributing to a lowered mood state. For example, someone who feels a persistent sense of gloom and believes this is because "I am a failure and a burden to others" may avoid social situations (descent behaviour), thus reducing the chance of experiencing disconfirming evidence and contributing to continued use of the descent behaviour and low mood (this is also predicted by the Interpretations of Depression Questionnaire; Jones & Day, 2008). Rumination is viewed by Mansell et al. (2007) as an example of a descent behaviour. Studies have found that high levels of self-reported rumination in response to depressive symptoms are correlated with vulnerability to BD (e.g. Knowles, Tai, Christensen & Bentall, 2005; Thomas & Bentall, 2002).

Dodd et al. devised a questionnaire to examine the tendency of people to use ascent, descent and control behaviours. The Behaviour Checklist includes items such as "...hyped myself up as much as possible" (ascent behaviour), " ...withdrawn from other people" (descent behaviour) and "...had regular breaks to unwind" (control behaviour). This measure of ascent and descent behaviours has not yet been validated and only one published study has used it (Dodd et al. 2011a). In a student sample (Dodd et al., 2011a), ascent behaviours were predicted by HAPPI scores, HPS scores and baseline Internal State Scale (ISS; Bauer et al., 1991) Activation. Thus, people who assign extreme personal meaning to changes in internals states were more likely to engage in ascent behaviours, people at risk for BD were more likely to use ascent behaviours and people in activated states were more likely to adopt behaviours that would increase activation. There was no association between the HAPPI and normalising behaviours. These results support the predictions made by the ICM.

It is worth noting that the coping responses element of the ICM is similar to what is proposed in both the ICS and the adapted SPAARS previously discussed. Thus, rather than being model specific, the coping responses proposed represent an elaborated version of

what would be predicted based on the other models. However, the elaboration is helpful for increasing understanding of coping in BD.

1.3.5.4 Additional contributory factors

Internal state interpretation and coping responses are influenced by factors such as personal beliefs about the self, world, others, affect and affect regulation and life events. The HAPPI discussed earlier was specifically designed to assess these beliefs.

1.3.5.5 Summary

Many of the concepts from the models already discussed are incorporated into the ICM e.g. life events (cognitive model), beliefs (cognitive model and BAS dysregulation model) and appraisals (BAS dysregulation model, ICS and SPAARS). Furthermore, the ICM expands on what would logically be predicted from other models (e.g. ICS and SPAARS) to give a more detailed account of coping responses in BD. By fully explaining each box proposed in the ICM Mansell et al. (2007) provide a more detailed account of emotion regulation in BD and of how dysregulation may occur, which may lead to the experience of a mood episode. There is preliminary evidence for the feasibility and acceptability of CBT based on this model (Searson, Mansell, Lowens & Tai, 2012). However, despite the use of ICM framework as a whole to explore recovery in BD I (Mansell, Powell, Pedley, Thomas & Jones, 2010; Mansell et al., 2011) and the collection of studies that have explored appraisal style in at-risk (Dodd et al., 2010; 2011a; 2011b; 2001d; Mansell et al., 2008) and clinical samples (Dodd et al., 2011c; Mansell & Jones, 2006), there is still a need for prospective research to examine to predictive value of the HAPPI and further research to explain cognitions related to emotions based on the ICM in clinical samples. Further research is also needed to examine each box of the ICM (specifically with regard to coping responses) and to identify exactly how people

with BD move through this model using alternative experimental designs i.e. rather than being heavily reliant on self report measures such as the HAPPI.

1.3.6 The Self-Regulation Model (SRM)

1.3.6.1 The original SRM

The SRM was originally developed to understand how people regulate responses to signs of physical ill health in an attempt to explain how people use coping behaviours to try and bring their current health state in line with their desired health state. How people interpret their illness has an influential role over the whole model by guiding what coping strategies (CS) are employed. The outcome of these strategies is appraised and fed back through the system, thus continually updating beliefs about illness and CS.

Leventhal et al.'s (1984) SRM (Figure 6) suggests that situational stimuli (e.g. symptoms) generate both cognitive and emotional representations of the illness and that these representations are processed in parallel through 3 stages. *The cognitive level*: firstly, one forms a representation of the illness (based around 5 cognitive dimensions, discussed next, and influenced by emotional reactions at the emotional level). They then adopt strategies to cope with the illness (based on the cognitive representation, emotional reactions and previous outcome appraisals), and lastly one appraises the efficacy of these coping strategies. *The emotional level*: in parallel and association with the cognitive level, stimuli evoke emotional responses leading to emotional representations (influenced also by the cognitive representations). For example, at the cognitive level the representation might be 'there is nothing I can do about my symptoms' while at the emotional level the representation might be fear/panic. Coping strategies are formed and appraised in light of emotional reactions, with respect to influences from the cognitive level and previous outcome appraisals. The model incorporates a continuous feedback loop in which the results

of the appraisal process (at both the cognitive and emotional level) are fed back into the formation of the illness representation and the adoption of CS.

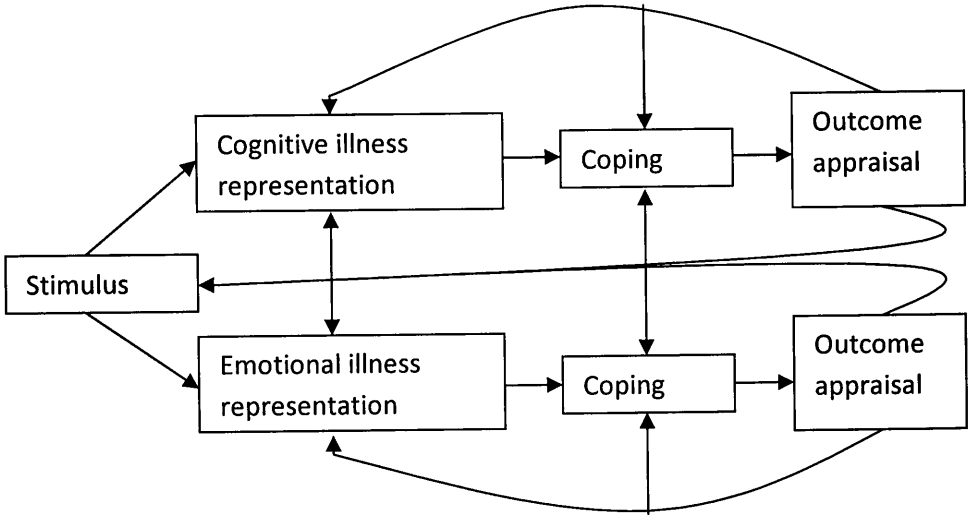


Figure 6: Leventhal et al.'s (1984) SRM

1.3.6.2 Cognitive representations

Early research (Leventhal et al., 1984) identified 5 dimensions within the cognitive representation of the SRM: identity (a label, signs/symptoms), consequences (physical, social and behavioural), cause, timeline (duration of illness) and cure/control. The Illness Perception Questionnaire (IPQ; Weinman, Petrie, Moss-Morris & Horne, 1996) was developed as a quantitative measure of the 5 cognitive dimensions of the SRM. This was later revised into the IPQ-R; Moss-Morris et al., 2002) in which additional dimensions were added by splitting control into personal and treatment control, adding a cyclical timeline dimension, an illness comprehensibility dimension (comprehensive understanding of illness) and an emotional representation. Broadbent, Petrie, Main and Weinman (2006) further developed a Brief IPQ (BIPQ) in which the dimensions were summarised as follows; 5 dimensions within the cognitive representation (consequences, timeline, personal control, treatment control and identity), 2 within the emotional representation (concern and emotions), and 2 additional dimensions of illness comprehensibly and cause.

1.3.6.3 The SRM and physical health

The SRM has proved to be helpful for understanding illness perceptions and their association with coping and outcome in physical health, thus providing useful information to inform treatment in physical health (see Hagger & Orbell, 2003, for a meta-analysis of studies applying the SRM to physical health problems). The SRM has been used in heath psychology to examine a wide range of physical health problems including arterial fibrillation (e.g. McCabe & Barnason, 2012), bowel disease (e.g. Rochelle & Fidler, 2013), brain injury (Snell, Hay-Smith, Surgenor & Siegert, 2013), breast cancer (e.g. Fischer et al., 2013), cardiovascular disease (e.g. Steca et al., 2013), chronic kidney disease (e.g. Jansen et al., 2013), chronic pain (e.g. Galli, Ettlin, Palla, Ehlert & Gaab, 2010), cyctic fibrosis (e.g. Sawicki, Sellers & Robinson, 2011), diabetes (e.g. Paddison, Alpass & Stephens, 2010), fibromyalgia (Glattacker, Opitz & Jäckel, 2010), irritable bowel syndrome (e.g. Chilcot & Moss-Morris, 2013), myocardinal infarction (e.g. Alsen, Brink, Persson, Brändström & Karlson, 2010), rheumatoid arthritis (e.g. Van Os, Norton, Hughes & Chilcot, 2012) and sleep apnea (e.g. Sampaio, Pereira & Winck, 2012).

1.3.6.4 The SRM and mental health

Based on the utility of the SRM for understanding physical health problems it has since been applied to mental health problems (for review see Baines & Wittkowski 2012; Lobban, Barrowclough & Jones, 2003). One limitation of applying illness models to mental health, highlighted by Kinderman, Setzu, Lobban and Salmon (2006), is that they assume that people possess relatively consistent sets of beliefs about their health and that these reflect underlying, relatively consistent models of illness. However, the nature of a mental health problem itself may interfere with an individual's ability to reflect on their experiences because psychiatric patients may not have coherent beliefs about their ill health and may lack insight into their health problems. If one does not believe oneself to be ill, one cannot

hold 'illness beliefs'. However, reviews of the SRM in mental health have supported the application of the SRM to mental health, highlighting that the SRM illness dimensions were largely supported by individuals with mental health disorders and that cognitive representations were associated with coping and outcome (Baines & Wittkowski 2012; Lobban et al., 2003).

To date, much of the research into the SRM and mental health has focused on psychosis (Freeman et al., 2013; Kinderman et al., 2006; Lobban & Barrowclough, 2005; Lobban, Barrowclough & Jones, 2005a; Lobban, Barrowclough & Jones, 2005b; Lobban, Barrowclough & Jones, 2004; Theodore et al., 2012; Watson et al., 2006; Williams & Steer, 2011), eating disorders (DeJong, Hillcoat, Perkins, Grover & Schmidt, 2012; Higbed & Fox, 2010; Holliday, Wall, Treasure & Weinman, 2005; Marcos, Cantero, Escobar & Acosta, 2007; Stockford, Turner & Cooper, 2007), depression (Brown et al., 2001; Cabassa, Lagomasino, Dwight-Johnson, Hansen & Xie, 2008; Fortune, Barrowclough & Lobban, 2004; O'Mahen, Flynn, Chermack & Marcus, 2009) and mood disorders (Munson, Floersch & Townsend, 2009) rather than BD specifically.

1.3.6.5 The SRM and BD

Few published papers have used the SRM to understand responses to mood changes in BD specifically (for exceptions see Lobban, Solis-Trapala, Tyler, Chandler & Morriss, 2013; Hou, Cleak & Peveler, 2010). Hou et al. (2010) found preliminary evidence for illness beliefs (specifically increased consequences and timeline), assessed by the IPQ-R, being significant predictors of non-adherence to medication in BD. Thus, drug treatment for BD may benefit from further assessment of such beliefs. In a recent prospective study, Lobban et al. (2013) examined the impact of illness beliefs, assessed by the BIPQ, on bipolar symptoms in a sample of 91 euthymic BD I or II participants over a 24 week period. Time to relapse was associated with beliefs about consequences, identity (symptoms) and concern. Beliefs about

consequences and personal control impacted on weekly depressive symptom scores after controlling for baseline depression, medication and number of previous episodes. This was the first study to specifically examine the impact of beliefs on outcome in BD but highlights a potentially important avenue for further research. If these results are replicated in future studies this would suggest that modification of such beliefs is an important focus for intervention.

1.3.6.6 Summary

According to the SRM framework, differences in mood management outcome are associated with differences in illness beliefs and the CS employed based on these beliefs. Preliminary evidence (Lobban et al., 2013) suggests that beliefs about mood swings impact on symptomatic outcome in BD. However, the IPQ, IPQ-R and BIPQ do not measure coping and so cannot comment on how beliefs and CS are linked or how CS impact on outcome. It may be that people with BD experience mood episodes, not because of their specific illness beliefs, but because of inappropriate CS employed. Indeed, this is the premise on which early warning signs (EWS) intervention is based and research consistent with this notion has been published previously (see Lam & Wong, 2005 for a review). Further expansion of this measure and exploration using different methodological approaches with bipolar samples is needed to examine the SRM in full. Due to its dynamic nature the SRM needs to be assessed over time to examine how variables impact on each other to change beliefs in the light of appraisals. There are, however, some methodological difficulties with temporal assessments because changes are likely to occur moment by moment, and therefore cannot be measured using standard longitudinal designs. A technique such as Experience Sampling Methodology (ESM) may be more appropriate because it allows for momentary assessments and the examination of how changing one variable impacts on another e.g. a representation held regarding one's illness at time 1 may lead to the employment of a certain CS but at time 2

(subsequent time point) this representation may be different, thus a different CS may be utilised. With further research using clinical samples the SRM may prove to be a useful framework for understanding mood management in BD.

1.3.7 Summary of the accounts; where do we go from here?

While advancing our knowledge regarding the psychological mechanisms in BD, many of these models offer incomplete accounts of BD when viewed separately. However, there seem to be common themes throughout these theories, thus adding validity to the premises on which they are based.

Despite evidence that people with BD share cognitive styles with unipolar depression, Beck's (1967) original dichotomous framework is not supported by previous research and cannot comment on more complex mood states such as mixed episodes. More research is needed to clarify whether dysfunctional attitudes represent a trait or state-like phenomena, to provide a more comprehensive account of mania and to clarify the directionality of dysfunctional attitudes. This cognitive model would also benefit from more longitudinal studies assessing the predictive value of different types of life events for symptoms of depression and mania.

A wealth of research suggests that BAS sensitivity is associated with vulnerability to mania in line with the BAS dysregulation model (Depue & Iacono, 1989; Urosevic et al., 2008). Support for the BAS dysregulation theory comes from self-report, prospective and neurobiological studies. However, more prospective studies of BAS sensitivity are needed along with a clearer explanation of transition to depression, despite arguments that the key issue in BD is mania (Johnson et al., 2012).

The ICS (Bernard, 2004; Teasdale & Bernard, 1993) is a more detailed model with multi-levels and multi-systems but due to a general lack of research pertaining to the ICS and

BD, it remains to be seen whether this model is empirically and clinically useful for understanding BD.

The SPAARS model (Power & Dalgleish, 1997; Jones, 2001) offers a similarly detailed account but builds on the ICS by paying more attention to both cognitions and emotions and providing an account of normal emotional experiences. Previous research supports the notion that self-dispositional hypomanic appraisal styles are associated with BD but few studies have used the SPAARS model in its entirety, perhaps due to its complexity. Thus, a more testable version is needed along with further explanations of what is happening at each stage and whether the processes proposed are specific to BD.

The ICM (Mansell et al., 2007) provides a detailed account of how people with BD regulate (or fail to regulate) mood. The ICM builds on, and includes, elements from the other models and each box is fully explained, thus providing a more detailed account of emotion regulation in BD. Previous research supports the notion that appraisal style (of extreme personal meaning) is associated with BD. However, testing the ICM in its entirety may prove difficult. Prospective research is needed to examine the impact of appraisal style on bipolar symptoms longitudinally and further testing using multiple experimental designs with clinical samples is required.

In order to understand the process of mood identification and regulation, the current research used the SRM framework originally proposed by Leventhal et al. (1984). The SRM provides a useful framework to describe how individuals process illness information, it is widely applicable (to a range of health problems thus allowing comparisons across disorders), normalising (we all go through the same stages thus allowing comparisons between clinical and non-clinical populations) and dynamic (recognises that mood changes over time, can be reappraised and explains processes rather than phenomena at a fixed point). Further, the SRM incorporates many of the proposals made by the other models (see Table 2). All models agree that something has to trigger the processes incorporated in the

models and make a connection between beliefs and emotion. Therefore these stages seem particularly relevant for future research.

Although the SRM provides a useful framework for understanding mood management in BD and incorporates many of the concepts proposed in the other psychological models (and some that are not) there is a need to build on this model to detail what is actually occurring at each stage (stimuli, representation, coping, and appraisal) and how these processes impact on outcome. Thus, a strength of the SRM is the structure but a weakness is the lack of previous research applying the SRM specifically to BD. To this end, the current research aimed to expand the cognitive arm of the SRM by proposing a novel model of mood management in BD. The emotional level of the SRM is underdeveloped compared to the cognitive level. In line with previous research, this thesis focussed on the cognitive arm of the SRM only. Details of how the cognitive arm of the SRM was expanded in the current research are provided in the following section.

Table 2: Overlap Between the SRM and the Other Psychological Models

SRM	Cognitive model	BAS dysregulation	ICS	SPAARS	ICM
Stimulus	Critical incident	Environmental cue	Sensory/affector change	Event	Event
Cognitive representation	Dysfunctional beliefs	Relevance and efficacy appraisals	Propositional subsystem	Associative and propositional levels	Appraisals of personal meaning
Coping	Not included	Not included	Not included	Behavioural tendencies are discussed but not included in the diagram	Expands the idea of coping strategies being important in mood regulation and proposes two types of coping strategies: ascent behaviours and descent behaviours
Outcome appraisal	Not included	Not included	Not included	Not included	Not included
Feedback loop	Other than the linear cognitive model and the BAS dysregulation model, all the other models incorporate some form of feedback loop.				

1.4 Expanding the cognitive arm of the SRM: 5 stages of mood management

An explanation of how the 5 stages of mood management proposed in the current research fit into, and expand, the stages proposed by the SRM cognitive arm is given in Table 3 and displayed visually in Figure 7. Differences found between people with and without BD at any of the stages proposed may indicate why symptom escalation occurs for people with BD and would warrant further testing.

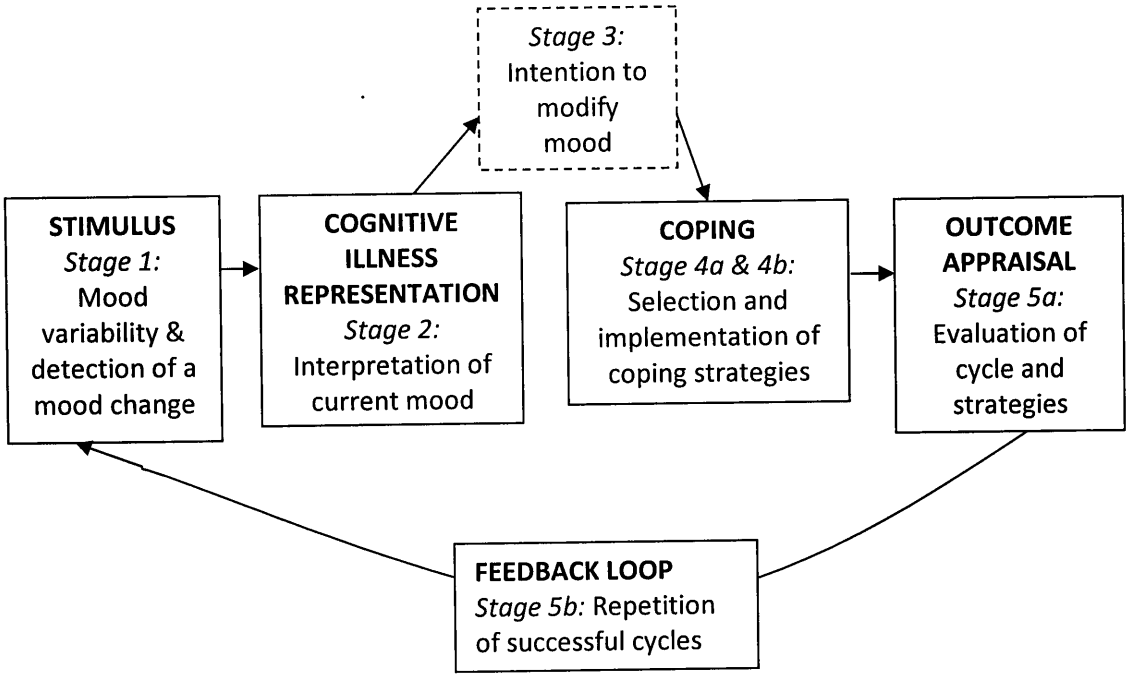


Figure 7: How the 5-stage mood management model fits into the SRM framework

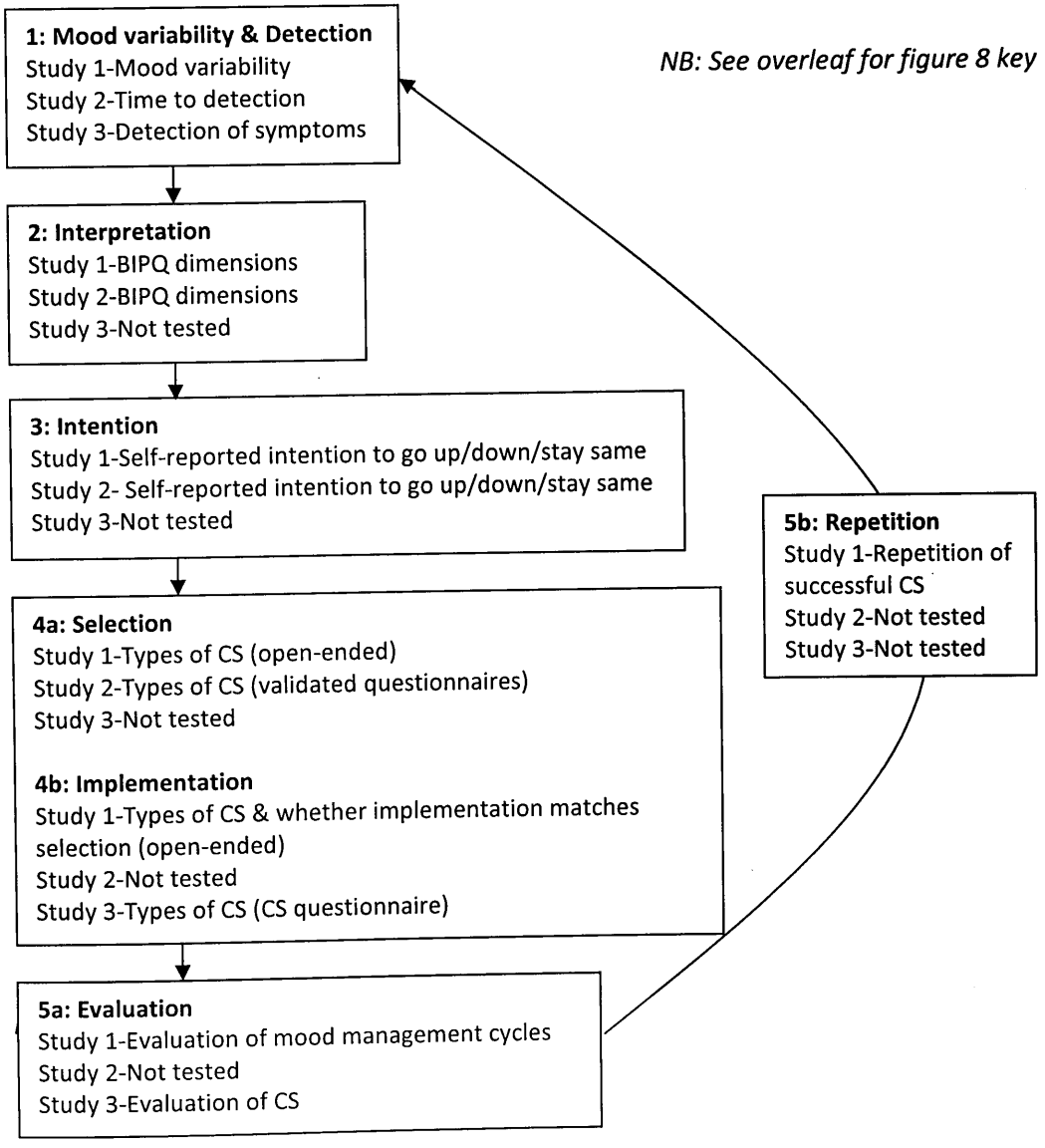
The evidence relating to each stage of the mood management model proposed will now be reviewed, highlighting how the results from previous research relate to each stage of this novel framework and providing an evidence base to inform the development of current hypotheses.

Table 3: How the 5-Stage Mood Management Model Fits into the SRM Framework

Stage	How SRM stage was examined and expanded
SRM Stimulus -> Mood variability and detection	Tested and expanded by investigating a) whether there were any differences in the experience of mood variability between people with and without BD, b) whether people with and without BD differed in time taken to detect a change in mood and c) the common types of symptoms detected by people with BD as signs of relapse. Mood variability and detection of a mood change made up stage 1 of the current model.
SRM Cognitive representation -> Interpretation	Examined using an amended version of the BIPQ (Broadbent et al., 2006) to identify the types of interpretations people with and without BD make regarding their mood and whether there were differences in interpretations between these groups which could indicate vulnerability to relapse in BD. Six of the dimensions from the BIPQ relevant to the current research were examined separately in line with the current hypotheses (stage 2).
The addition of Intention	Following interpretation of a mood change it seemed logical that people would form an intention to either keep current mood the same, make it go up or make it go down. Therefore, an extra box was added to the current model relating to one's intention to modify mood (stage 3). This allowed for examination of group differences in intention and of whether the coping strategies selected and implemented (at the following stage) were in line with what people intended to do to their mood.
SRM Coping -> Selection and implementation of coping strategies	A detailed examination of, and distinction between, the strategies people with and without BD *select* and *implement* to manage mood was needed. Therefore coping strategy selection (stage 4a) and implementation (stage 4b) made up stage 4 of the mood management model proposed.
SRM Outcome appraisal -> Evaluation	The outcome appraisal stage of the SRM was tested and developed by investigating what evaluations people with and without BD make regarding the impact of mood management cycles and the impact of coping strategies utilised on mood (stage 5a).
SRM Feedback loop -> Repetition	The feedback loop proposed in the SRM was examined in a final stage to assess whether people with and without BD differ in their ability to use the results from previous cycles of mood management to influence subsequent responses to mood changes (stage 5b).

1.5 Evidence for the 5 stages of mood management

The literature pertaining to each stage of the mood management model is presented below. The studies in which the specific stages were tested in the current research are highlighted following the headings in the subsequent sections and in Figure 8 (see Chapter 2 for details of the methodologies used in each study). In brief, Study 1 was an experience sampling study comparing people with and without BD across all stages on mood management; Study 2 used a mood induction (MI) procedure to compare mood management between people with and without BD at stages 1-4a of the mood management model; and Study 3 was a cross-sectional survey study of data collected through the PARADES RCT regarding early warning signs and coping strategies in people diagnosed with BD.



Study 1 = ESM
Study 2 = MI
Study 3 = survey design
BIPQ = Brief Illness Perception Questionnaire
CS = Coping Strategies

Figure 8: How the stages of mood management were tested

1.5.1 Stage 1: Mood variability and detection

1.5.1.1 Mood variability (Study 1, Chapter 3)

BD is characterised by long-term mood instability. People with BD often experience daily fluctuations in mood that are influenced by multiple, interacting variables including social support, environmental stress, medication use, sleep disruption, and internal cyclic processes (Lieberman, Kelly, Douglas & Goodwin, 2010). A number of studies have reported increased mood variability in BD, including studies of remitted (Knowles et al., 2007), subsyndromal (Lovejoy & Steuerwald, 1995) and currently episodic (van der Gucht et al., 2009) participants with BD. Further, greater mood instability has been reported in relatives of people with BD (Jones et al., 2006b) and people at risk for BD (Bentall et al., 2011; Hofmann & Meyer, 2006) according to scores on the Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986), suggesting that fluctuations in mood may also be a core characteristic of vulnerability to BD.

Experience Sampling Methodology (ESM) has been used previously to examine mood variability in BD. Knowles et al. (2007) compared 16 remitted bipolar participants, 16 participants with remitted unipolar depression and 19 healthy controls using diaries completed twice a day for one week. The Positive and Negative Affect Scale (PANAS; Watson, Clark & Tellegren, 1998) was used to measure daily fluctuations in positive affect (PA) and negative affect (NA). Individual mean scores and standard deviations (to measure variability) were calculated for PA and NA over the study week. Although there were no significant differences between bipolar and control groups in mean levels of PA or NA, the bipolar group showed stronger fluctuations in both PA and NA. It is worth noting that

Knowles et al. (2007) only measured mood twice a day and therefore may not have been able to capture, in full, detailed variability in mood across the week. Recently, Pavlickova et al. (2013) integrated 9 mood items (4 measuring PA and 5 measuring NA) into an ESM diary which participants with BD (28 in remission, 12 currently depressed and 8 currently hypomanic) responded to 10 times a day for 6 days. Fluctuations in mood were defined as an absolute change in moment-to-moment PA or NA, with higher scores reflecting greater fluctuation. Depression and mania were associated with more pronounced fluctuations in both PA and NA, suggesting that perhaps the increased fluctuations found in Knowles et al.'s (2007) study were due to subsyndromal symptoms.

Taken together, the literature suggests that people with BD would be more likely to experience increased variability in mood compared to healthy controls, but this variability may be affected by mood symptoms (note that all participants included in the current research were euthymic and only experiencing normal-very mild mood symptoms).

1.5.1.2 Time to detection (Study 2, Chapter 4)

People with BD may be anxious about normal mood fluctuations because they interpret them as indicating the onset of a mood episode. If people with BD are tracking their mood for signs of a fluctuation, they may be more vigilant to subtle changes in mood. However, despite a number of studies reporting that people with BD are able to report prodromal symptoms (e.g. Altman, Rea, Mintz & Miklowitz, 1992; Joyce, 1985; Keitner et al., 1996; Lam & Wong, 1997; Molnar, Feeney & Fava, 1988; Smith & Tarrier, 1992), larger numbers are still unable to spontaneously do so (Lam & Wong, 1997; Mantere, Suominen, Valtonen, Arvilommi & Isometsa, 2008). Therefore, people with BD may be insensitive to subtle changes in mood which is why minor changes in mood can escalate into a mood episode for these people. Thus, whether people with BD would be faster at detecting a change in mood than people without is unclear.

1.5.1.3 Detection of early warning signs (EWS; Study 3, Chapter 5)

There are 2 types of bipolar prodrome (or EWS); one of BD onset and the other of recurrence of mood episodes. This research was only concerned with the latter. Bipolar prodromes have been defined as any cognitive, behavioural or affective symptoms that make a person think they are entering an early stage of an episode (Lam & Wong, 1997).

Several studies have reported that the majority of people with BD I (Altman et al., 1992; Keitner et al., 1996; Lam & Wong, 1997; Lam, Wong & Sham, 2001; Molnar et al., 1988; Smith & Tarrier, 1992; Wong & Lam, 1999) and II (Briet-Gabauer et al., 2010; Goossens, Kupka, Beentjes & van Achterberg, 2010) are able to detect prodromes of both mania and depression. However, these studies have used relatively small samples (n=19-74) and studies specifically examining the detection of the first prodromal symptoms (EWS) in larger samples have reported that only half of people with BD I and II can recognise these early symptoms (Goossens et al., 2010; Mantere et al., 2008). Despite this discrepancy, prodromal symptoms have been reported reliably over an 18 month period (Lam et al., 2001) and appear to be accurate when compared to reports from family members (Keitner et al., 1996).

1.5.1.3.1 Prodromes of mania

Manic prodromes are reported more frequently than depressive prodromes (Keitner et al., 1996; Lam & Wong, 1997; Mantere et al., 2008; Smith & Tarrier, 1992), suggesting that they are easier to identify. This may be because manic prodromes are more distinct from everyday experiences than depressive prodromes (Smith &Tarrier, 1992) and have a less insidious onset. For this reason, teaching people with BD to recognise prodromes of mania may be more useful in treatment than teaching people to recognise prodromes of depression. Perry, Tarrier, Morriss, McCarthy and Limb (1999) used a single RCT design to examine the efficacy of teaching people with BD to identify prodromal symptoms (of

depression and mania) and seek help at an early stage in relapse. Sixty nine participants with BD who had relapsed within the preceding 12 months received 7-12 individual treatment sessions which included training to identify EWS. At 18 month follow up, Perry et al. concluded that teaching people with BD to recognise EWS of mania (but not depression) increased time to relapse, social functioning and employment status.

There is general agreement across studies with regard to the most commonly reported prodromes of mania. The most common prodromes of mania are decreased need for sleep, increased energy/activity, elevated mood, increased sociability/talkativeness and racing thoughts (Breit-Gabauer et al., 2010; Goossens et al., 2010; Lam & Wong, 1997; Lobban et al., 2011; Molnar et al., 1988; Smith & Tarrier, 1992; Wong & Lam, 1999). Other common prodromes reported are irritability (Breit-Gabauer et al., 2010; Lam & Wong, 1997; Smith & Tarrier, 1992; Wong & Lam, 1999), creativity, senses feeling sharper (Smith & Tarrier, 1992) and spending money (Breit-Gabauer et al., 2010).

1.5.1.3.2 Prodromes of depression

Early symptoms of depression are less qualitatively different from residual depressive symptoms than those for mania and so distinguishing between the two may more difficult. Further, early symptoms of depression are generally cognitive and somatic and therefore harder to indentify than the behavioural prodromes associated with mania (Lam et al., 2001). There is less agreement regarding prodromes of depression and these prodromes are diverse (Jackson, Cavanagh & Scott, 2003; Lam & Wong, 2005; Sierra, Livianos, Arques, Castello & Rojo, 2007). However, the most common prodromes of depression reported are loss of interest in activity/people, decreased energy, feeling sad/wanting to cry and increased need for sleep (Briet-Gabauer et al., 2010; Lam & Wong, 1997; Lobban et al., 2011; Molnar et al., 1988; Smith & Tarrier, 1992). Other common prodromes of depression are memory/concentration difficulties (Briet-Gabauer et al., 2010; Molnar et al., 1988),

decreased motivation (Lobban et al., 2011; Smith & Tarrier, 1992), low confidence (Smith & Tarrier, 1992) and not being able to put worries aside (Lam & Wong, 1997).

In addition to a number of common prodromes, people with BD also report idiosyncratic symptoms as indicators of relapse (Keitner et al., 1996; Lam & Wong, 1997; Wong & Lam 1999). Indeed, Molnar et al. (1998) highlighted the wide inter-individual variation but little intra-individual variation.

1.5.2 Stage 2: Interpretation (Study 1, Chapter 3 and Study 2, Chapter 4)

Following the detection of a mood change, the SRM proposes that mood is interpreted according to 5 cognitive dimensions. The original dimensions of the SRM (Leventhal et al., 1984) have been revised more recently and summarised in the Brief Illness Perceptions Questionnaire (BIPQ; Broadbent et al., 2006). The BIPQ was adapted in the current research to be relevant for use with both a control and bipolar sample rating current mood. This adaptation is consistent with previous studies in which the terms used in the BIPQ have been adapted to suit the participants responding to it (Lobban et al., 2005; Lobban et al., 2013). The amended BIPQ includes the following dimensions: consequences (positive and negative); personal control; concern; comprehensibility and time line. The cause dimension was assessed using the Hypomanic Interpretations Questionnaire (HIQ; Jones et al., 2006a) and Interpretations of Depression Questionnaire (IDQ; Jones & Day, 2008). The literature pertaining to each of the cognitive dimensions examined in the current research will now be reviewed.

1.5.2.1 Consequences

The BIPQ fails to do distinguish between negative and positive consequences. However, mood fluctuations may be interpreted as having both negative and positive consequences by people with and without BD. Therefore, in the current research, the

consequences dimension was split to assess the interpretation of both negative and positive consequences of a mood change.

1.5.2.1.1 Negative Consequences

People with BD encounter a high number of recurrences of affective episodes (ten Have et al., 2002), prodromal symptoms (Lam & Wong, 1997; Wong & Lam, 1999) and often experience functional impairment as a consequence of this course (Fagiolini et al., 2005; Judd et al., 2008). Indeed, symptoms of BD must cause significant distress or impairment in functioning to meet diagnostic criteria for BD I (and BD II for depression) according to the Diagnostic and Statistical Manual for Mental Disorders IV (APA, 2000). Professional life is often affected by the mood swings experienced as part of the course of BD (see Gilbert & Marwaha, 2013 for a review) and erratic behaviours displayed during mood episodes can also cause interpersonal and social problems.

Long-term impairment in functioning has been reported in a number of studies (e.g. Judd et al., 2008). Impairment is evident even during long periods of remission (Fagiolini et al., 2005) and is correlated with symptoms of BD (Fagiolini et al., 2005; Bauer et al., 2009). In a 5 year follow-up study Coryell et al. (1993) reported that people with BD suffered job status and income decline and showed significant deficits in all other areas of psychological functioning measured at follow-up. Similarly, Hirschfield et al. (2003) and Kupfer et al. (2002) reported high unemployment rates (60%), even among college-educated individuals. Additionally 65% of Kupfer et al.'s sample reported difficulty maintaining long-term relationships. In a 10 year follow-up study, Goldberg and Harrow (2004) reported that overall functioning, work related functioning and frequency of hospitalization was worse for bipolar compared to unipolar depression. Less than half of the bipolar sample had good work functioning throughout the follow-up. ten Have et al. (2002) analysed the data from the first wave of The Netherlands Mental Health Survey and Incidence Study (NEMESIS) conducted in

1996 and found that, compared to people with other types of disorder (BD NOS, other mood disorder, anxiety disorder and substance use disorder), people with BD were impaired by their illness more often. They averaged more days of bed rest and of absenteeism due to emotional problems in the 12 months preceding the 1996 interview. Lifetime suicide attempts and perceived low quality of life were more likely for people with BD compared to the other disorders and 4 weeks prior to interview, people with BD were more likely to report feeling nervous and depressed and have difficulties at work or in other areas due to their emotional problems.

In addition to the subsyndromal symptoms that may be present throughout the course of BD, people with BD suffer extreme mood fluctuations and these extreme changes in mood (mood episodes) that can have a devastating impact on everyday functioning and lead to hospitalisation. Thus, people with BD may interpret the consequences of a change in mood as having more significant negative consequences than people without BD, based on past experience of a mood change leading to a mood episode. According to Mansell et al. (2005; 2007) it is one's attempt to overcome perceived negative consequences of mood episodes that results in the behavioural symptoms that characterise BD.

1.5.2.1.2 Positive consequences

The research discussed paints a very negative picture of the consequences of BD and much of this evidence is based on long-term users of mental health services. Therefore, it is important to pay attention to the possible positive consequences of BD. Attention to the positive aspects of BD has important implications for outcomes. If positive aspects can be maintained or enhanced, while negative aspects minimised, then outcome for people with BD may be significantly improved.

Research in the last decade has begun to pay attention to the positive aspects of BD. For example, Seal, Mansell and Mannion (2008) reported positives of hypomania including

increased sociability, self-confidence and productivity. In a review of the literature on positive psychological features of BD, Galvez, Thommi and Ghaemi (2010) concluded that enhanced levels of positive psychological traits (spirituality, empathy, creativity, realism and resilience) were associated with BD. However, this review also highlighted the lack of literature on the positives of BD. In a recent study, Lobban, Taylor, Murray and Jones (2012) specifically examined the positive aspects of BD. In their study, participants with BD I (n=6) and II (n=4) were recruited from non-NHS support groups, thus eliminating the biases associated with recruiting participants in long-term contact with mental health services. Qualitative methods were used to allow exploration of positives perceived by participants in their own words, rather than as categories defined by the researcher. Lobban et al. found that participants openly expressed many positive aspects of BD, including increased productivity, increased empathy and sensitivity to others and experiencing a wide range of emotions. Furthermore, negatives were viewed as necessary for the positives i.e. to feel the highs, you must experience the lows. When participants were asked "if you could press a button and get rid of your BD, would you press it" 7 out of 10 said no, suggesting that the positives consequences of BD outweigh the negative ones. The 3 participants who said they would press the button had all been sectioned and lost their jobs as a result. For these 3 participants the negative consequences experienced in the past may have impacted upon their perceptions of future consequences (i.e. that the consequences would be negative and therefore it would be better not to have BD). It should be noted that the sample was recruited from non-NHS support groups only, therefore these results may not be generalisable to the wider population of people with BD which includes people who access NHS services and were potentially bias in the opposite direction to the research related to negative consequences discussed previously. This research does, however, highlight the need to include positive aspects when examining perceived consequences of BD.

While the evidence base for positive consequences in BD is rather limited, there is a growing interest in this area and the research discussed suggests that people with BD are likely to interpret both more negative *and* positive consequences associated with a change in mood compared to healthy controls.

1.5.2.2 Personal control

A number of studies by Mansell and colleagues (Higginson, Mansell & Wood, 2011; Mansell & Carey, 2009; Mansell, 2005) have examined the ability of Perceptual Control Theory (PCT; Powers, 1973) to explain psychological disorders and have highlighted control as pertinent to understanding psychopathology. PCT suggests that we continually compare our current state to our desired state and try to reduce any discrepancy (error) between the two. In order to reduce error, an individual sets themselves a primary goal and subsequent sub-goals which are enacted to achieve the primary goal. Control is hierarchical and so control at higher levels only sets sub-goals but does not produce behaviour. Conflict between sub-goals, which prevents the achievement of the primary goal, is what causes psychopathology (Mansell, 2005). Conflict is resolved by the reorganisation of higher level systems on a trial-and-error basis. With specific regard to BD, Mansell et al.'s (2007) ICM proposes personal control as central to understanding mood swings. Changes in internal state are interpreted as having extreme personal meaning which triggers personal efforts to control negative consequences. Control is exerted through ascent and descent behaviours which paradoxically escalate symptoms.

Receiving a diagnosis of BD can have a major impact on the individual and leave them feeling they have little control over the disorder (Parker, 2007). A number of studies state the importance of self-management in the positive course of BD (e.g. Salyers, Godfrey, Mueser & Labriola, 2007; Lorig & Holman, 2003; Bodenheimer et al., 2002). Self-management is defined as exerting personal control over one's symptoms. However, despite

attempts to control mood escalation, relapse rates in BD are high (e.g. Angst, 1978; ten Have et al., 2002; Post et al., 2003; Judd et al., 2003; Miller, Uebelacker, Keitner, Ryan & Solomon, 2004; Brieger, Rottig, Rottig, Marneros & Priebe, 2007) and there is evidence that people with BD feel they lack control. For example, Crowe et al. (2012) interviewed 21 people with BD currently under community mental health service in New Zealand between 2008 and 2009 regarding their experience of BD. Feeling out of control was the core theme to emerge from transcriptions of interviews which was characterised by feeling overwhelmed, a lack of autonomy and flawed.

In summary, a key feature of BD is difficulty controlling extreme emotions which leads to episodes of depression and mania. There is evidence for a lack of control over both positive (e.g. Gruber, Harvey & Purcell, 2011b) and negative emotions (e.g. Green et al., 2011) in BD. Therefore, people with BD are likely to perceive less personal control over mood compared to healthy controls.

1.5.2.3 Concern

The literature reviewed in the previous section on perceived consequences following a mood change suggests that although there are potential positives associated with mood fluctuations in BD (Lobban et al., 2012; Galvez et al., 2010; Seal et al., 2008), there are also potential negative consequences such as difficulties in occupational, social and psychological functioning (Gilbert & Marwaha 2013; Bauer et al., 2009; Judd et al., 2008; Fagiolini et al., 2005; Goldberg & Harrow, 2004; Hirschfield et al., 2003; Kupfer et al., 2002; ten Have et al., 2002; Coryell et al., 1993). Thus, when people with BD experience a change in mood they may become concerned that this signals the onset of a mood episode with related negative consequences on their everyday life.

The amount of concern one has with a change in mood is also likely to be associated with the amount of control they perceive they have over that mood state. The literature

suggests people with BD perceive a lack of personal control over their mood (e.g. Crowe et al., 2012) and therefore concern is likely to be heightened in BD. This notion is supported by Lobban et al.'s (2013) finding that personal control was rated low and concern was rated high in a study of 91 euthymic bipolar participants using the BIPQ. Therefore, people with BD are likely to perceive more concern regarding mood compared to healthy controls.

1.5.2.4 Comprehensibility

The SRM (Leventhal et al., 1984) proposes that people construct a mental representation of their illness to make sense of it and to understand it. Based on interpretations of the illness, attempts are made to cope with the illness, control associated consequences and improve the course of the illness. Moss-Morris et al. (2002) added the illness comprehensibility dimension to the IPQ-R to assess the extent to which illness representations provide a coherent understanding of the illness. They viewed this dimension as "a type of meta-cognition" in which the individual evaluates the coherence of the illness i.e. an overarching dimension of how much an individual understands their illness and how much it makes sense to them. Building a personal model of illness centres on beliefs related to the other cognitive dimensions of the SRM assessed by the BIPQ (Broadbent et al., 2006). Together these beliefs form a coherent model of illness. Thus, how people with and without BD perceive the other dimensions may impact illness comprehensibility.

There is a lack of research on illness comprehensibility in BD, therefore making predictions about similarities and/or differences in illness comprehensibility between people with and without BD is difficult. Findings from research examining other mental health problems may be of interest. Higbed and Fox (2010) explored illness perceptions in anorexia nervosa (AN), focussing on personal models of AN using qualitative techniques, and reported that participants' found it difficult to make sense of AN as an illness. Participants typically suggested pathology arose from brain abnormalities rather than considering themselves to

have a mental health problem. What it means to have AN remained unresolved. Godoy-Izquierdo, Lo´pez-Chicheri, Lo´pez-Torrecillas, Ve´lez and Godoy (2007) looked at lay models of illness across 3 physical (cancer, hypertension and influenza), and 2 mental health problems (depression and schizophrenia). They found that the personal experience of having physical or mental health problems had an impact on representations of illness and on overall understanding of that problem. This may have been due to past experience of coping, to some extent, with that illness.

Together these findings suggest that illness comprehensibility may also differ between people with and without BD. However, research on case formulations for people with mental health problems suggests that through collaborative work with professionals, people are able to build coherent models of illness (Kinderman & Lobban, 2000; Persons, 2005). The fact that intervention was needed to allow individuals to make sense of their illness and build a personal model of illness indicates that people with mental health problems do not generally hold such models and thus may lack illness comprehensibility. Further exploration of illness comprehensibility in BD is needed.

1.5.2.5 Time line (duration)

According to the DSM-IV (APA, 2000) symptoms of depression must be present for at least 2 weeks for a diagnosis of a depressive episode and symptoms of mania must be present for at least 1 week (or necessitate hospitalisation) for a diagnosis of a manic episode. However, prodromal symptoms of these mood episodes may be present for a much longer period of time prior to the most intense symptoms experienced in a full-blown episode (Judd et al., 2002). The mean number of days for manic prodromes has been reported to be 20.5 to 29 and for depression to be between 11 and 19, with a large range between 1 and 365 days (Molnar et al., 1988; Smith & Tarrier, 1992). Thus, by definition, people with BD have experienced prolonged changes from normal mood (mood episodes) perhaps with an

accompanying prodromal period extending this phase. Based on this past experience, people with BD are more likely to interpret a change in mood as lasting for a longer time compared to healthy controls.

1.5.2.6 Cause

The Hypomanic Interpretations Questionnaire (HIQ; Jones et al., 2006a) was designed to measure tendency to make personal attributions following common hypomanic-relevant experiences. The HIQ has 2 sub-scales; 1) positive self-dispositional appraisals and 2) normalising appraisals. The initial structure of the HIQ was based on the Symptoms Interpretation Questionnaire (SIQ; Robbins & Kirmayer, 1991) and items were developed based on descriptions of hypomanic symptoms in the DSM-IV (APA, 2000), the General Behaviour Inventory (GBI; Depue et al., 1981) and the Internal States Scale (ISS; Bauer et al., 1991).

Hypomanic experiences include subsyndromal symptoms such as increased alertness, energy and reduced sleep. The attribution of these experiences to internal characteristics (positive self-dispositional appraisals) may lead to positive automatic thoughts, positive beliefs about the self and behaviour that escalate the initial mood fluctuation. A number of studies have found that people with BD (and those at risk for BD) score significantly higher on the HIQ than a matched non-clinical sample when controlling for mood symptoms (e.g. Ankers & Jones, 2009; Jones et al., 2006a; Jones & Day, 2008; Mansell & Jones, 2006). Thus, people with BD are likely to attribute the cause of a mood change to internal characteristics, which may in turn exacerbate the initial symptoms experienced. For example, one may experience increased energy and attribute this to being a 'happy, positive, energetic person' (positive self-dispositional) thus explaining the cause of their mood as linked to internal characteristics of the self rather than external situational factors such as 'something has disrupted my routine' (normalising).

Jones and Day (2008) later developed the Interpretations of Depression Questionnaire (IDQ; Jones & Day, 2008) to evaluate negative appraisals which could lead to the exacerbation of depressive prodromes. The IDQ was modelled on the structure of the HIQ and the items contained were confirmed to be plausible explanations for depression-relevant situations by experienced academic clinical psychologists. The IDQ has 2 sub-scales; 1) negative self-dispositional appraisals and 2) normalising appraisals.

If an individual attributes depression-related experiences such as decreased energy and feelings of sadness to internal characteristics this could lead to a downward spiral in mood, similar but of opposing valence to the upward spiral described above. For example, one might feel guilty though nothing in particular is wrong and attribute this experience to being 'a bad person...' (negative self-dispositional) rather than external situational factors such as '...I am under strain at the moment' (normalising). Jones and Day (2008) found that negative self-dispositional appraisal style was positively predictive of current depressed mood in people vulnerable to BD.

In summary, previous research suggests that people with BD are more likely to make internal attributions for both positive and negative experiences.

1.5.3 Stage 3: Intention (Study 1, Chapter 3 and Study 2, Chapter 4)

Previous models of BD (reviewed in Section 1.3) have not included a box specifically related to intention. However, previous research regarding Dysfunctional Attitudes Scale (DAS; Power et al., 1994) in BD suggests that people with and without BD may differ in how they intend to modify mood.

A factor analysis of the original DAS (Weissman & Beck, 1978) using data from participants with BD yielded 3 factors: Goal Attainment, Dependency and Achievement (DAS-24; Lam et al., 2004). The Goal Attainment factor related to beliefs about striving to have constant positive emotion, control over feelings, efficient problem-solving and the ability to

excel. Dependency related to the need to be validated by others and Achievement to a need to achieve in order to be acknowledged. Lam et al. (2004) found that euthymic bipolar participants had significantly higher scores on the Goal Attainment subscale compared to participants with remitted unipolar depression when significant depressive symptoms and residual symptoms were controlled. Scores on the Goal Attainment subscale also correlated with number of past hospitalisations due to mania and bipolar episodes as a whole, indicating that high Goal Attainment scores may be associated with mood escalation to mania. People with high Goal Attainment beliefs may see certain hypomanic prodromal symptoms as positive states. For example, an individual may believe that being more talkative indicates the desirable state of increased sociability and therefore the individual may be less motivated to manage this symptom to regulate mood, but rather increase activity (e.g. increased socialising) leading to escalation into a manic episode. This would explain why Lam et al. (2004) found that high Goal Attainment scores correlated with more hospitalisations due to mania.

Wright et al. (2005) used the DAS-24 to examine dysfunctional attitudes in euthymic BD I participants following positive and negative mood induction (MI). While they found no differences between bipolar participants, participants with remitted unipolar depression BD and controls at baseline or after negative MI, people with BD showed significantly less change in total DAS scores, particularly Goal Attainment and Achievement scores, following positive MI compared to the other 2 groups. Thus a desire to experience positive emotion remains even after positive MI for people with BD.

More recent studies have found that participants with remitted BD did not differ from participants with remitted unipolar depression on Goal Attainment dysfunctional attitudes (Perich et al., 2011; Alatiq et al., 2010; Mansell et al, 2010). However, Perich et al. (2011) *did* find that remitted bipolar participants scored higher than *controls* for Goal Attainment dysfunctional attitudes and that remitted bipolar participants scored significantly

higher than participants with remitted unipolar depression and controls on the Dependency and Achievement subscales of the DAS-24. Other studies have found that only Achievement dysfunctional attitudes are elevated in BD (Tzemou & Birchwood, 2007; Babakhani & Startup, 2012). However, Babakhani and Startup (2012) noted that following mood induction (MI) mood change was more pronounced in the sad MI condition than the happy MI condition in 49 euthymic bipolar participants, therefore a greater change in Goal Attainment dysfunctional attitudes may have been found had the effects of the happy MI been stronger. As with Goal Attainment dysfunctional attitudes, increased dysfunctional Achievement attitudes may also lead to intention to increase mood in order to experience hypomanic symptoms associated with productivity, creativity and motivation.

Goal Attainment dysfunctional attitudes have been found to contribute significantly to scores on the Sense of Hyper-Positive Self Scale (SHPSS; Lam, Wright & Sham, 2005) after controlling for current mood. The SHPSS lists 7 adjectives used to describe positive aspects of a mild 'high' state by people with BD. Bipolar participants with strong sense of hyper-positive self (SHPS) scores enjoyed being in a 'mild hypomanic' state (not severe enough to meet hypomania criteria) in which they experience constant positive mood and increased behavioural activity and arousal. Participants who showed strong SHPS had an increased risk of relapse and benefited less from cognitive therapy. This group may be unperturbed to identify certain symptoms as early warning signs of a manic episode due to their enjoyment of these experiences. Thus, indicating a reason why Lam et al. (2005) found that participants with strong SHPS had increased risk of relapse.

Lee, Lam, Mansell & Farmer (2010) more recently examined the relationship between SHPS and preference for a 'high' internal state. They also investigated whether dysfunctional attitudes were predictive of responses to scenarios associated with manic prodromes using the Scenario Rating Task (SRT; Mansell, 2003). The SRT is a self report measure describing 8 different scenarios related to a 'mild hypomanic' state, which

participants rate according to how much they identify with the trait described and the extent to which they would increase a certain behaviour in response to the scenario. With a sample of people with BD I, support was found for Lam et al.'s (2005) findings that participants with high SHPS desired mild high mood states. Goal Attainment attitudes predicted the extent to which participants indicted they would increase their activity in response to the scenarios in the SRT. Thus, these participants were likely to engage in behaviours that escalate symptoms (opposing mood regulation) resulting in increased risk of a manic episode.

Further support for the notion that people with BD desire a mild high mood state comes from research into positives in BD (see Section 1.5.2.1.2 for positive consequences of BD). People with BD have been reported to express several positive aspects of BD, associated with hypomania including increased productivity, increased empathy and sensitivity to others and experiencing a wide range of emotions (Lobban et al., 2012).

With regard to low mood, evidence suggests that people with BD respond to negative emotion in a way that exacerbates initial low mood (e.g. Knowles et al., 2005; Thomas & Bentall, 2002). See Section 1.5.4.1.1 for details. However, it is unlikely that people with BD actually intend to make their mood go down following a downward mood change due to depression being characterised by undesirable symptoms such as lack of enjoyment, motivation and energy.

Taken together, these results suggest that people with BD strive for, and enjoy, a state of mild hypomania. Research using MI techniques has specifically highlighted that people with BD maintain a desire for consistent positive emotion even after positive MI (Wright et al., 2005). Therefore, following an upward shift in mood, or when current mood is high, people with BD would be more likely than controls to intend to make their mood go up. Following a downward mood change, or when current mood is low, both groups would be likely to intend to modify mood up due to low mood being an undesirable state. Note that what people *intend* to do is not necessarily what they *actually* do.

1.5.4 Stages 4a & 4b: Selection and implementation of coping strategies (CS)

1.5.4.1 *Selection: Response Styles Questionnaire (RSQ) and Responses to Positive Affect Questionnaire (RPA) (Study 2, Chapter 4)*

1.5.4.1.1 Responses to negative affect (the RSQ)

The Response Styles Theory (RST; Nolen-Hoeksema, 1987; 1991) attempts to explain the way in which people respond to negative affect. The RST posits four types of response styles (negative rumination, distraction, problem-solving and dangerous activities) which are assessed using the Response Styles Questionnaire (RSQ; Nolen-Hoeksema, 1991). Negative rumination refers to behaviours or thoughts that focus one's attention on the depressive symptoms and is associated with longer and more severe periods of depression, while distraction is characterised by engagement in pleasant or neutral activities that take focus away from depressive symptoms and is associated with less severe symptoms (Just & Alloy, 1997; Nolen-Hoeksema, 2000; Nolen-Hoeksema, McBride, & Larson, 1997; Nolen-Hoeksema & Morrow, 1993; Nolen-Hoeksema, Parker, & Larson, 1994). Dangerous activities refer to activities such as drug use and reckless driving which are pleasurable yet maladaptive. Finally, problem-solving is seen as a constructive response which can be instrumental in alleviating depressive symptoms.

Thomas and Bentall (2002) noted that problem-solving and dangerous activities were not reliability represented in Nolen-Hoeksema's original RSQ and therefore expanded the RSQ to include more items to assess these response styles. Knowles et al. (2005) later factor analysed the expanded RSQ and found a three-factor solution in which the items on the rumination and dangerous activities subscales remained clustered almost exactly as predicted by Noel-Hoeksema, but the distraction and problem-solving subscales loaded on a single factor of active-coping. Active-coping strategies are adaptive responses which promote mood stability such as enjoyable activities, socializing and asking for appropriate assistance with problems (i.e. adaptive responses).

Although the focus of the majority of research regarding the RST have focussed on unipolar depression, there is a growing body of literature that reports that, like people with unipolar depression, people with BD ruminate on negative affect more than healthy controls (Bentall et al., 2011; Alloy et al., 2009; Van der Gucht et al., 2009; Johnson, McKenzie & McMurrich, 2008b; Thomas et al., 2007; Knowles et al., 2005; Thomas & Bentall, 2002) and rumination is correlated with depressive symptoms in BD (e.g. Knowles et al., 2005; Thomas & Bentall, 2002).

Early studies of response styles in BD focussed on people at risk for BD according to scores on a measure of hypomanic personality; the Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1984). Thomas and Bentall (2002) administered the expanded version of the RSQ to a student sample and found a combination of negative rumination, distraction and dangerous activities (but not problem-solving) responses predicted scores on the HPS. They also found that depression was strongly associated with negative rumination. However, response styles only explained 17% of the variance in HPS data, thus indicating that other processes contribute to the development of hypomanic personality. For this reason, exploring each stage of the mood management model proposed in the current research is important for the investigating of the contribution of multiple processes to the development and maintenance of BD.

In line with Thomas and Bentall (2002), Knowles et al. (2005) found a positive association between hypomanic personality and negative rumination and dangerous activities. Both response styles were associated with increased levels of depression and lower positive emotion. Thus, negative rumination and dangerous activities were associated with both depression and hypomania but also with lower positive emotion. Additionally, Knowles et al. (2005) found a positive association between hypomanic personality and adaptive responses. Adaptive responses were correlated with positive emotion and inversely correlated to depression, suggesting that this response style is an effective way of reducing

depression and maintaining stable mood. The fact that adaptive responses also correlated with hypomanic personality suggests that some elements of hypomania may be adaptive, such as increased confidence, sociability, creativity and motivation. This notion is supported by research on the positives of BD (see Section 1.5.2.1.2).

More recently, studies have included clinical samples. Thomas, Knowles, Tai and Bentall (2007) administered Knowles et al.'s (2005) version of the RSQ to a sample of participants with BD (manic, depressed and euthymic) and healthy controls to assess whether episode type affected response styles in BD. With regard to negative rumination, they found that depressed, and remitted bipolar participants in particular, reported high levels of negative rumination compared to manic bipolar and control participants. Manic bipolar participants scored higher than all other groups on adaptive coping and dangerous activities. These results suggest that comparison studies of bipolar and control participants regarding responses to low mood should take into account current symptoms. Van der Gucht et al. (2009) compared the same samples in a separate study and found that all bipolar participants (regardless of episode) reported greater negative rumination compared to controls. Thus, even when people with BD are euthymic, they still display a cognitive vulnerability to depression. There were no group differences in adaptive responses and the manic bipolar participants reported more dangerous activities than controls.

Johnson et al. (2008b) later focussed on the rumination subscale of the RSQ and found that students with BD (BD I, BD II and BS NOS) ruminated in response to negative affect more than controls but that group differences were accounted for by levels of current symptoms of depression. Thus, greater endorsement of negative rumination in BD may be attributable to higher levels of depressive symptoms in this group. Further, when people are depressed they may overestimate their tendency to focus on negative emotions. Therefore, controlling for current mood may be important in analysis of response styles in BD. In a 3.5 year follow-up study of people with bipolar spectrum disorders (BSD), Alloy et al. (2009)

found that people with BSD ruminated significantly more than controls when controlling for current depressive and hypomanic symptoms. Further, negative rumination predicted number of depressive episodes over the follow-up period. These results further suggest that negative rumination in BD leads to increased relapses of depression rather than merely reflecting a response to having discrete emotional fluctuations that prompt increased focus on negative mood.

In the first prospective study of the RSQ, Pavlickova et al. (2013) used Experience Sampling Methods (see Section 2.1 for an overview of experience sampling) to examine response styles to depression and associations with mood in 48 bipolar participants (28 remitted, 12 depressed and 8 hypomanic) during 6 days of daily life. Participants responded to diarised questions up to 10 times a day when signalled by a wristwatch. Pavlickova et al. (2013) found that low mood significantly predicted negative rumination and that negative rumination lowered mood at the subsequent time point. Thus, people with BD are not only more likely to ruminate when low but the act of rumination also decreases mood consequentially setting up a vicious cycle that may lead to depression.

In summary, the research with at risk samples suggests a cyclical pattern of negative rumination, dangerous activities and adaptive coping may underlie hypomania (Thomas & Bentall, 2002; Knowles et al., 2005), yet a different pattern has been found for people with BD. People with BD tend to ruminate more on negative emotion than controls (Van der Gucht et al., 2009; Alloy et al., 2009; Johnson et al., 2008b) but tendency to ruminate on negative emotion may depend on episode type (Thomas et al, 2007).

Research with bipolar samples further suggests that manic bipolar participants utilise dangerous activities more than depressed/euthymic bipolar and control participants (e.g. Thomas et al., 2007; Van der Gucht et al., 2009). Pavlickova et al. (2013) reported that risk-taking activities were marginally ($p=0.07$) predicted by positive affect and that, in turn, risk-taking increased positive mood thus indicating a cycle that may lead to mania. Van der Gucht

et al. (2009) found no differences between BD (in all episode types) and controls in adaptive coping, while Thomas et al. (2007) found manic bipolar participants use adaptive coping more than all other bipolar groups and controls. However, given that control participants are able to maintain stable mood it seems logical to expect control participants to utilise more adaptive strategies than people with BD. Indeed, Pavlickova et al. (2013) found adaptive coping improved mood and self-esteem. Further research is required to assess the use of dangerous and adaptive coping strategies in BD.

Participants in Study 2 will be screened for significant symptoms, therefore the bipolar sample are likely to report more negative rumination compared to controls, but the groups are unlikely to differ in responses regarding dangerous activities. Given that controls are able to maintain stable mood, this group are likely to report more adaptive strategies compared to people with BD.

1.5.4.1.2 Responses to positive affect (the RPA)

While research suggests that people with BD engage in negative rumination in response to negative affect (see previous section), there is also evidence that people with BD engage in positive rumination in response to positive affect. The Responses to Positive Affect questionnaire (RPA; Feldman et al., 2008) was developed to parallel the RSQ and assess cognitive responses to positive affect. The RPA comprises of 3 factor-analysed subscales. The dampening subscale measures responses to positive affect that are likely to reduce the intensity and duration of the positive mood state. The positive rumination (PR) subscales measure responses to positive affect that focus attention on positive mood, self-qualities and circumstances. Two types of PR are identified; self-focussed PR which relates to thoughts about the positive aspects of the self; and emotion-focussed PR which relates to thoughts about the positive affective state.

There are mixed findings regarding responses to positive affect. Feldman et al. (2008) found that people at risk for BD reported more positive rumination *and* more dampening in response to positive affect. Gruber, Eidelman, Johnson, Smith and Harvey (2011a) obtained similar results with an inter-episode bipolar sample. However, some studies have found that people at risk for BD, and with a diagnosis of BD, report more rumination in response to positive affect but not more dampening (Johnson et al., 2008b; Raes, Daems, Feldman, Johnson & Van der Gucht, 2010). Other studies have found that people at risk for BD, and with a diagnosis of BD, report more dampening in response to positive affect but not more positive rumination (Johnson & Jones, 2009; Edge et al., 2013). One reason for the mixed findings may be the samples used. The majority of studies have not used participants with BD I and therefore have excluded participants who suffer functional impairment due to increases in positive affect. Edge et al. (2013) and Gruber et al. (2011a) included people with remitted BD I and found more dampening of positive emotion in BD. Dampening might reflect a need to down-regulate positive emotion to avoid experiencing an episode of mania. On the other hand, dampening has been associated with higher levels of depression (Feldman et al., 2008) and lower self-reported quality of life (Edge et al., 2013). Therefore, how adaptive dampening is remains unclear. A further reason for the mixed findings may be differing appraisals of internal states. The use of either positive rumination or dampening strategies is likely to depend on one's appraisal of the change in mood (stage 2 of the mood management model-see Section 1.5.2). The importance of appraisal style for risk of relapse has been highlighted in previous theories of BD (e.g. Mansell et al., 2007).

Although dampening of positive affect might be expected by people with BD I, increased use of strategies that sustain and enhance positive affect (positive rumination) would also be expected by people with BD I and II, given that BD is characterised by periods

of sustained elevated mood (APA, 2000) and evidence that people with BD strive for, and enjoy mild hypomania (see Section 1.5.3).

Please note that in Study 2 the selection of CS was examined using items from the RSQ and RPA. In Study 1 the selection and implementation of CS were examined using open-ended questions and in Study 3 implementation was examined using a predetermined checklist. The relevant literature pertaining to studies 1 and 3 is presented below.

1.5.4.2 Types of CS selected (Study 1, Chapter 3) and implemented (Study 1, Chapter 3 and Study 3, Chapter 5)

A number of studies have attempted to categorise and report the most common CS used in BD (Breit-Gabauer et al., 2010; Depp et al., 2009; Lam & Wong, 1997; Lam et al., 2001; Wong & Lam, 1999). For example, Lam and Wong (1997) measured coping in 40 BD I participants not in an acute episode using 'The Coping with Prodromes Interview'. Participants were asked to report what they did in response to early warning signs (EWS) of mania and depression in an open-ended question format. While there was a wide variety of CS used and a high degree of variability among participants, behavioural strategies were mostly employed to cope with mania and a mixture of behavioural and cognitive strategies were employed to cope with depression.

Coping with mania (but not depression) has been found to impact on social functioning (Lam & Wong, 1997) and both bipolar episodes and symptoms at 18 month follow-up (Lam et al., 2001). A number of studies have specifically examined coping in mania and have reported several common types of coping strategies used by people with BD. Wong and Lam (1999) developed a specific measure of coping with mania in BD; The Coping Inventory for Prodromes of Mania (CIPM). A Principal Components Analysis (PCA) was conducted on data from 206 participants with BD I (41% stable, 39% depressed and 20%

hypomanic/manic) and revealed 4 subscales; 1) Stimulation reduction (efforts to avoid over-stimulation or cut down task); 2) Problem-directed coping (strategies aimed at alleviating symptoms); 3) Seeking professional help (including medication adherence); 4) Denial or blame (refusal to believe symptoms exist or taking it out on others). Stimulation reduction, seeking professional help and less denial or blame CS were related to better social functioning. Problem-solving coping was not related to social functioning and therefore may not be as important in reducing manic relapses. Another study using the CIPM found differences between partially or completely remitted BD I and II participants (n=203) in CS for mania (Parikh et al., 2007). BD I participants used a wider range of CS and scored significantly higher on the seeking professional help scale than BD II participants. This may be because manic episodes for this group are more severe and have potential negative consequences. Hypomanic episodes experienced by people with BD II may be pleasurable and so this group may be less motivated to seek help to reduce symptoms or reduce symptoms themselves.

Lam et al. (2001) examined the types of CS that were related to good outcome in a prospective 18 month follow-up study of the same population as used in Lam and Wong's (1997) study. CS for mania fell into 3 subcategories; 1) Modifying excessive behaviour (e.g. prioritising and reducing number of tasks); 2) Early medical intervention (e.g. seeing GP, taking extra medication) 3) Stimulating CS (e.g. enjoying the feelings and filling extra minutes of the day). Behavioural CS were related to fewer relapses and stimulating CS to more relapses, of mania. Only coping with mania at baseline predicted bipolar episodes and manic symptoms at 18 months, further providing evidence for the importance of the coping with manic prodromes to staying well with BD. In a more recent study of 94 BD I and II participants in Austria Breit-Gabauer et al. (2010) found the most typical CS for mania were seeing a doctor/adjusting medication, rest, avoiding stimulation, calm activities and enjoying the exhilaration.

A number of common CS for depression have been reported but there is less consensus between studies, perhaps due to less research. Lam et al. (2001) proposed 3 subcategories of CS in depression: 1) Behavioural CS (e.g. get organised and sort out worries); 2) Cognitive CS (e.g. distract self from negative thoughts and evaluate if things are worth worrying about); and 3) Maladaptive CS (e.g. stay in bed and take extra sleeping tablets). Behavioural strategies were related to fewer relapses, while passive CS were related to increased relapses at 18 month follow-up. Breit-Gabauer et al. (2010) reported the most common CS used to cope with depression as adaptive strategies such as social contact, seeing a doctor/adjusting medication and pleasant activities.

Despite some common findings, studies have tended to use small samples of 32-40 participants (Lam et al., 2001; Lam & Wong, 1997) or have employed methods of testing that may be limited (Wong & Lam, 1999; Parikh et al., 2007) i.e. the CIPM which should be interpreted with caution due to issues around reliability (Parikh et al., 2007). Briet-Gabauer et al. (2010) used a structured interview to elicit responses in 94 participants with BD but results may have been biased by the types of questions asked and the interviewer's technique. Each question was followed by a related example which could have influenced responses e.g. 'How do you normally act when you feel a manic phase coming on? For example, spending time alone to avoid stimulation'. Indeed, Briet-Gabauer et al. found that 'spending time alone to avoid stimulation' was reported by participants as a typical CS for mania. Depp et al. (2009) used a larger sample of 1,024 adults with BD in an online study and reported the most common strategies for coping to be taking medications, isolating from others and practicing good sleep habits. However, they did not distinguish between CS for depression and mania and BD diagnosis was not systematically verified.

CS in BD deserve more attention and should be studied using adequate sample sizes and measures that distinguish between coping with depression and mania. What might be helpful for managing low mood may not be effective for managing high mood and vice versa.

Further, the selection and implementation of the types of CS discussed here have not been studied separately and participants have generally responded to closed-answer questionnaires. A more detailed examination is needed of what people intend to do to self-regulate mood (selection) and what they actually do (implementation) using both closed and open-ended questions which allow idiosyncratic responses. Disassociating selection from implementation not only allows an examination of the *types* of CS used at these stages of mood management but also allows investigation of whether people with BD *implement* the types of CS they *select*. It may be that what people with BD intend to do to manage mood (selection) is adaptive but what they actually do (implement) may escalate symptoms and lead to increased risk of relapse and vice versa.

1.5.5 Stage 5a: Evaluation

1.5.5.1 Evaluation of mood management cycles (Study 1, Chapter 3)

The evaluation of mood management cycles as an entire process in BD has received little attention previously. Rather, evaluation has focussed on elements of the processes of mood management i.e. the types of CS used during these cycles (see Section 1.5.5.2 below). Based on qualitative interviews with 33 hospitalised bipolar participants, Pollack (1995; 1996) reported that evaluation received little attention by most participants and those who did use self-evaluation tended to think about short-term results rather than using evaluation as a continuous, longer term process. Further, she proposed that a number of factors affect evaluation, such as current mood state. One participant specifically reported that if someone feels good then they are unlikely to spend time thinking about whether self-management strategies have contributed to this feeling but rather the good feeling is accepted without evaluation of why it has occurred (Pollack, 1995). Pollack concluded that evaluation does not occur spontaneously or in a deliberate manner in BD. Without deliberate engagement in evaluative processes, people with BD are not able to deliberately repeat cycles of mood

management that have been successful in regulating mood (Stage 5b) in the past. Therefore, subsequent strategies employed may be done so in an arbitrary, or even maladaptive, manner. Further research is needed to understand the evaluation of mood management cycles in BD.

1.5.5.2. Evaluation of coping strategies (CS) (Study 3, Chapter 5)

In a number of studies of coping in BD, the authors have evaluated CS as adaptive or maladaptive. For example, Lam and Wong (1997) categorised CS into good and poor strategies for both depression and mania. To cope with depressive prodromes, organisation, social support, distraction from/dealing with negative thoughts were the most commonly used good CS. Ignoring symptoms and taking extra medication were the most commonly used poor CS for depression. To cope with manic prodromes, calming activities, modifying behaviour and retraining oneself were the most commonly used good CS. Enjoying the high and continuing to take on more were the most commonly used poor CS for mania. However, Lam and Wong (1997) did not provide details of the criteria used to categorise CS as 'good' or 'poor'. In a later study, Wong and Lam (1999) used the CIPM to categorise CS in BD as stimulation reducing, problem-directed, seeking professional help and denial or blame CS. They evaluated the first 3 as theoretically adaptive and the latter as theoretically maladaptive for coping with mania. In line with Wong and Lam's (1999) evaluation, Breit-Gabauer et al. (2010) more recently reported that the most commonly used CS for mania (seeing a doctor/adjusting medication, rest, avoiding stimulation and calm activities) were positive apart from one: enjoying the exhilaration. All of the CS used for depression (e.g. social contact, seeing a doctor/adjusting medication and pleasant activities) were deemed positive by the authors.

In all but one (Depp et al., 2009) of the previous studies of coping in BD, the CS have been evaluated as adaptive/maladaptive by the authors rather than the participants

themselves. Depp et al. (2009) asked 1,024 adults with BD to indicate the perceived helpfulness of 27 self-management strategies in an online survey. Although participants had tried 74% of the strategies, only 23% were found 'very helpful'. The most commonly tried strategies were taking medications, isolating from others and practicing good sleep habits. Taking medication as prescribed was reported to be very helpful, whereas isolating from others was rated most unhelpful. Further, being an advocate for others with BD was reported as very helpful, yet was one of the least tried strategies. Although Depp et al. (2009) used a large sample and was the first study to ask participants about perceived helpfulness of CS, this study was limited due to not systematically verifying BD diagnosis and not distinguishing between coping with prodromes of depression and mania. What might be helpful for managing high mood may not be effective for managing low mood and vice versa.

In summary, the evaluation (by participants themselves) of both mood management cycles and the types of CS used by people with BD to manage high and low mood (separately) requires further testing.

1.5.6 Stage 5b: Repeat (Study 1, Chapter 3)

A number of studies have reported that people with BD engage in behaviours that exacerbate initial symptoms of depression (Knowles et al., 2005; Mansell et al., 2007; Nolen-Hoeksema, 1991; Thomas & Bentall, 2002) and mania (Lam et al., 2005). Given the consensus on this idea it seems likely that people with BD repeat strategies that exacerbate initial symptoms and do not learning from previous unsuccessful cycles of mood management to employ alternative strategies to manage mood. Control participants do not experience extreme fluctuations in mood and therefore it seems likely that this group repeat strategies that are successful at regulating mood. However, it is worth noting that controls may fare better because they do not have to manage extreme mood changes and perhaps if extreme

mood fluctuations were experienced by healthy controls, they would also have difficulties with mood management. The repetition of previously used CS deserves attention.

1.5.7 Summary

The literature reviewed suggests that the processes involved in mood management, and incorporated into the mood management model, will differ between people with and without BD. If specific stage at which people with BD diverge from adaptive self-regulation of mood then can be highlighted then these stages can form the focus of future prospective research to ultimately understand why symptom escalation occurs in BD and aid effective intervention. An overview of the methodological techniques used to test mood management processes follows.

CHAPTER 2: METHODOLOGY

A variety of methodological approaches were used in the current research. The following sections provide a summary of Experience Sampling Methodology (Section 2.1), a systematic review of mood induction techniques for bipolar research (Section 2.2) and an overview of the data collection method and study design for data collected through the PARADES RCT (Section 2.3).

2.1 Experience Sampling Methodology (ESM)

2.1.1 What is Experience Sampling Methodology (ESM) and why use it over other methodological approaches to study bipolar disorder (BD)?

Researchers use the terms Experience Sampling Methodology (ESM; Larson & Csikszentmihalyi, 1983; Csikszentmihalyi & Larsen, 1987). Momentary Assessment (EMA; Stone & Shiffman, 1994) and ambulatory assessment (Fahrenberg & Myrtek, 2001) interchangeably despite there being some distinctions (see Trull & Ebner-Priemer, 2009). For the purposes of this research ESM was is used as an umbrella term for all of these approaches which share in common multiple momentary assessments of phenomena in daily life settings.

ESM has been used to study a range of psychological disorders such as depression and psychosis. However, the focus here will be on how ESM can be used to enhance research on bipolar disorder (BD). Several reviews of ESM for mood disorders exist (aan het Rot, Hogenelst & Schoevers, 2012; Trull & Ebner-Priemer, 2009; Wenze & Miller, 2010) along with a number of general reviews of ESM (Christensen, Barrett, Bliss-Moreau, Lebo & Kaschub, 2003; Moskowitz, Russell, Sadikaj, & Sutton, 2009; Shiffman, Stone & Hufford, 2008; Trull & Ebner-Priemer, 2013). Therefore this section only aims to provide an overview of ESM, paying particular attention to the use of ESM in studies of BD.

Experience sampling refers to a set of empirical methods that allow participants to respond to questions within the context of their daily lives (Christensen et al., 2003). Thoughts, feelings and experiences are captured in detail (through repeated assessments), as they occur (momentary assessments of current state) and in the context in which they occur (increasing ecological validity). Thus, ESM builds on common psychological assessments that rely on global retrospective reports that may be biased by memory, cannot comment on dynamic changes in experiences over time or across contexts and are unable to investigate how variables impact on each other temporally. ESM provides multiple assessments per day and is therefore appropriate for the assessment of constructs that are likely to change frequently and rapidly, such as mood. A detailed, complex set of data is provided by ESM that can address questions regarding individual differences in mood, specific mood episodes, how the processes of mood management unfold over time and can examine the interactions between these variables.

Although all ESM studies collect multiple assessments of momentary phenomena in an individual's natural environment, the sampling procedures, length of sampling, number of observations, thresholds for inclusion and devices vary depending on the research questions and resources available.

2.1.1.1 Sampling procedure

There are 2 types of sampling procedure; time-based and event-based sampling. Event-based sampling involves participants responding to study questions following a specified event e.g. when smoking. This method is appropriate for events that are less frequent in daily life and when the aim is to focus on particular events/behaviours rather than characterise a participant's entire experience. Details of time-based sampling can be seen in Table 4. All of the studies that have used ESM to explore BD have used time-based sampling with the majority using random time sampling (Depp et al., 2010; Depp, Kim, de

Dios, Wang & Ceglowski, 2012; Havermans, Nicolson & Devries, 2007; Havermans, Nicolson, Berkhof & deVries, 2010; Havermans, Nicolson, Berkhof, & deVries 2011; Husky et al., 2010; Myin-Germeys, Delespaul & van Os, 2003; Pavlickova et al., 2013) and only two using fixed time sampling (Fulford, Johnson, Llabre & Carver, 2010; Knowles et al., 2007).

Table 4: Time-Based ESM Sampling

Procedure	Time-based sampling	
	Fixed time sampling	*Random time sampling*
Involves...	...participants reporting experiences at fixed times throughout the day e.g. morning, afternoon and evening.	...participants reporting experiences in response to random signals.
Most appropriate for...	...studies aiming to broadly characterise phenomena over time (such as mood)	
Pros	Burden on participants is decreased through predictable signalling.	Participants cannot predict signals and therefore a more representative sample of participants' state is provided.
Cons	Participants may learn to prepare themselves for the signals or change their routine according to the signalling schedule.	Burden on participants is increased through unpredictable disruption.

2.1.1.2 Length of sampling, number of observations and thresholds for inclusion

The length of the sampling period and the number of observations taken should be sufficient to permit a reliable and valid assessment of the construct under investigation (Moskowitz et al., 2009). A range of waking hours should be covered by the sampling period (Palmier-Claus et al., 2011) and because mood is experienced continually, sampling several times a day is desirable (Trull & Ebner-Priemer, 2009). Typically studies of BD have sampled across 6 days with 10 alerts per day (Havermans, Nicolson & Devries, 2007; Havermans et al., 2010;Havermans et al., 2011; Myin-Germeys et al., 2003; Pavlickova et al., 2013). Four studies have used longer sampling periods (7-90 days) with fewer observations per day (1-4

observations; Depp et al., 2010; Depp et al., 2012; Fulford et al., 2010; Knowles et al., 2007) and one study sampled over only 3 days with 5 observations per day (Knowles et al., 2007).

A minimum of 20 valid responses is required in most studies of BD where 60 alerts are received in total (e.g. Havermans et al., 2007; Havermans et al., 2010; Havermans et al., 2011; Myin-Germeys et al., 2003). Large amounts of missing data are expected in ESM studies due to taking multiple assessments over multiple days when participants are trying to go about their daily routine. Therefore, the total number of observations is set at 60 (in most cases) to account for missing data and obtain the required number of valid responses. A number of studies using ESM in BD have also reported the thresholds set for inclusion as a valid response e.g. participants must respond to the alert within 20 minutes (Havermans et al., 2007; Havermans et al., 2010) or 30 minutes (Havermans et al., 2011) of the alert to be classed as a momentary response. However, these thresholds seem rather liberal and whether responses made 20-30 minutes after an alert constitutes a momentary response is debatable. A more conservative threshold of 10 minutes was set for the current research. Compliance with thresholds has generally been good. For example, in Knowles et al.'s (2007) study, 17 of 18 participants with BD, 14 of 16 participants with depression and 17 of 19 control participants met the minimum requirement for ESM measure completion.

2.1.1.3 Devices

Depending on resources, ESM can be implemented using computerised or paper-and-pencil methods (see Table 5 for details regarding these methods). Computerised sampling has been used in only two ESM studies using BD samples (Depp et al., 2010; Husky et al., 2010) while paper-and-pencil methods have been used successfully in several ESM studies using BD samples (Fulford et al., 2010; Havermans et al., 2007; Havermans et al., 2010; Havermans et al., 2011; Knowles et al., 2007; Myin-Germeys et al., 2003; Pavlickova et al., 2013). Despite the cons listed in Table 5 for the paper-and-pencil method there are a

number of solutions. Data errors can be minimised using appropriate data checking procedures. To reduce participants falsifying response times Palmier-Claus et al. (2011) suggest using random-sampling so that participants would have to guess the times of the alerts in order to falsify them and Moskowitz et al. (2009) suggest giving instructions to participants to miss entries rather than back-fill them. These suggestions were adopted in the current research and participants were additionally asked to record the times when the diary was not filled in and give reasons why.

Table 5: ESM Devices

Device	Computerised	Paper-and-pencil
How it works	Computerised devices such as palmtop computers, Personal Data Assistants (PDAs) and 'smart phones' are installed with software that enables participants to respond to study questions following an audible signal or following a specified event.	Participants are provided with paper diaries and either an additional device to signal participants to fill in the paper diaries (e.g. a wristwatch) or instructions to complete diaries at specified times or following specified events.
Pros	1. Allows recording of the exact time at which a response was given by the participant therefore ensuring participant entries are made within the thresholds of time specified to capture momentary responses. 2. Allow flexibility of item presentation (e.g. across time points or branching of items) 3. Data entry error is reduced by electronically downloading data from devices.	1. Affordable 2. Appropriate for use with people who are unfamiliar with technology therefore allowing a wider range of people to participate. 3. Appropriate for use in environments where computerised devices may be lost or stolen. Paper diaries can be easily replaced.
Cons	1. Expensive due to the cost of units and software. 2. May be inappropriate for use with certain people who are unfamiliar with technology. 3. May be inappropriate for use in certain environments where the devices may be lost or stolen.	1. Does not allow recording of the exact time at which a response was given by the participant. The researcher must trust that the time of entry stated by the participant is accurate. 2. Data entry is time-consuming. 3. Data entry is open human error.

2.1.1.4 Analysis of ESM data

ESM data consists of multiple observations from each participant and varying frequencies of completed observations per participant. Therefore, traditional approaches for analysis are not appropriate because they often require the same number of observations per participants and cannot handle missing data. Multi-level modelling is the most commonly used method of analysis for ESM data (see Schwartz & Stone, 1998 for a review). Multi-level modelling allows the implementation of regression models while accounting for the lack of independence between observations from the same participants i.e. responses from one participant are more likely to be similar than those from different participants. ESM data is defined as hierarchical because responses from participants (alert level) are nested within days (day level), within participants (participant level). Multi-level modelling can account for day-level variance and inter-individual variability in constructs as well as the fact that observations from the same participant that are closer in time are more likely to be similar than those further apart. Thus, multi-level modelling provides a detailed set of data and can take into account a number of variables that traditional methods cannot. See Section 3.4.3.1 for the general multi-level model (MLM) used in the current research.

With regard to missing data, there are two types of missingness: unit missingness (where the entire alert is missed) and item missingness (where particular items are missed while others are not). There are 3 categorisations of item missingness: missing completely at random (MCAR); missing at random (MAR); and not missing at random (NMAR). MCAR refers to a missing item pattern that does not depend on observed or unobserved data i.e. nothing predicts why the item is missing. This type of missing data is not a problem because there is no systematic reason for missingness and therefore no selection bias to the data set. MAR refers to a missing item pattern that can be expressed by the observations made and is not dependant on unobserved data. For example, an elderly person may have trouble remembering events. Again, MAR is not problematic because selection bias is accounted for.

Where the problem lies is with NMAR data. NMAR items are missed for reasons related to unseen observations. For example, participants may miss items due to low mood in bipolar research (thus, items are missed due to what is being examined). As missing data is not available to check, NMAR cannot be empirically ruled out but steps can be taken to assess the likelihood data is MCAR or MAR. To deal with unit missingness, and ensure that data was not missing due to the phenomena being tested (e.g. participants miss alerts because their mood is very low in a study of mood), the current research examined the reasons given for missed alerts by participants (see Section 3.4.1.2 for results). To deal with item missingness the current research examined what predicted missingness for variables with large amounts of missing data using the data obtained. For example current mood and intention were examined to assess whether these factors had an impact on the likelihood of missing the coping strategy selection and implementation items (see Appendix 9 for results).

When used to examine individual or group differences, ESM data is often aggregated across the study period to gain an average measure of the variable of interest. This type of data is therefore cross-sectional but because it is an aggregation of multiple assessments by the same individual/group regarding the same variable over several days, this type of data is expected to be more reliable, and also more valid, due to avoidance of recall bias and increased ecological validity (Shiffman et al., 2008; Wenze & Miller, 2010). Additionally, disaggregated time-specific ESM data can be used to examine temporal sequences of variables over time, investigate how one variable impacts on another at the proceeding time point and how one variable is influenced by another at the preceding time point using lagged analyses. Thus, ESM can be especially helpful for evaluating processes that are dynamic and assessing within-participant/group variability. Psychological models such as the Self Regulation Model (SRM; Leventhal et al., 1984) assume dynamic interactions between constructs. Therefore, it is important to consider temporal relationships between measurements across the assessment period as well as looking at aggregated data cross-

sectionally. The ability of ESM to address dynamic processes has been proposed as potentially the most important contribution of this method to clinical psychology (Shiffman et al., 2008; Wenze & Miller, 2010). To assess variability (in e.g. mood) across the study period, the within-participants/group standard deviation (SD) can be measured to reflect variability around the participant/group mean mood score and highlight the magnitude of fluctuation in mood across the study period (see Section 3.4.3.2 for how this was done in the current research).

2.1.1.5 ESM in BD

BD is characterised by instability of mood over time and therefore ESM provides an important insight into the features of BD as well as exploring the dynamic relationship between situational factors, experiences and symptoms. Indeed, a number of studies have used ESM to investigate BD. ESM has been used to investigate cross-sectional associations between variables in BD. Myin-Germeys et al. (2003) investigated the relationship between daily stressors and momentary positive affect (PA) and negative affect (NA) in participants with depression, BD and non-affective psychosis and found that stress was linked to low PA rather than high NA. Retrospective interviews would not have captured the subjective appraisals of minor dissatisfactions with current situations that occur in daily life. Havermans et al. (2007; 2010) used ESM to record not only PA and NA but also situational factors (what participants were doing) and experiences of positive or negative events between alerts. Bipolar participants with mild depressive symptoms reported large increases in NA following negative events (Havermans et al., 2010) and experienced negative events as more stressful than those without depressive symptoms (Havermans et al., 2007).

Knowles et al. (2007) used ESM to investigate differences between participants with remitted unipolar depression, BD and controls in mood and self-esteem variability across the sampling period and found that while average levels of mood and self-esteem did not differ

between BD and controls, bipolar participants showed more variability than controls. Thus, even in remission bipolar participants differ from controls. Retrospective interviews are not able to capture stability of processes in the way ESM can through repeated measurements over short periods of time.

ESM has been used to investigate temporal associations between variables in BD. Fulford et al. (2010) looked at how close remitted bipolar and control participants felt towards reaching 3 personal goals at each ESM assessment, how much effort they had made towards their goals since the prior alert and how much closer they expected to be by the subsequent alert. Interestingly, after making less progress than expected, both groups reported more future effort. After making unexpected progress the bipolar group reduced future effort significantly less than the control group. More recently, Pavlickova et al. (2013) investigated the relationship between mood, self-esteem and response styles to depression as well as contextual information using ESM. Cross-sectionally depression and mania were significantly related to low mood and self-esteem and increased fluctuations in these variables. Longitudinally, low mood predicted rumination and rumination dampened mood at the subsequent assessment. Thus, ESM allowed aggregated cross-sectional comparisons as well as temporal assessments. Traditional retrospective interviews do not allow investigation of the temporal associations examined in these studies.

ESM has also been used to study biological markers in BD (Havermans et al., 2011) and as a technique for intervention (Depp et al., 2010). Havermans et al. (2011) studied cortisol secretion through salivary cortisol during negative and positive daily events in remitted bipolar and control participants. They found that despite normal daytime cortisol levels and reactivity to daily events in remitted BD, participants with BD showed flatter diurnal slopes and larger fluctuations in cortisol across successive measures. Depp et al. (2010) investigated the usefulness of PDAs for repeatedly assessing mood in BD participants in order to aid personalised interventions when participants reported a change in mood.

They found depressive and manic symptoms reported using ESM correlated with mood ratings. The procedure resulted in decreased clinical-rated depression and participants felt that using the PDAs would help them to manage mood if employed as an intervention.

ESM has been reported to be feasible for use with BD samples, with satisfactory rates of acceptance and compliance. Further, no fatigue effects (missing data) due to time spent in the study were reported in a sample or 41 participants with depression or BD but testing was only conducted over 3 consecutive days (Husky et al., 2010). Consideration has also been paid to the most appropriate devices to use with this group. Depp et al. (2012) compared mobile phone and paper-and-pencil ESM procedures for bipolar participants and found that compliance was approximately twice as high with paper-and-pencil compared to mobile phones. Compliance also remained high using paper-and-pencil procedures but dropped off over the study using mobile phones. However, mobile ratings were better able to capture variability and were significantly correlated with clinical ratings while paper-and-pencil ratings were not. It should be noted that procedures used in the two conditions were different. In the phone condition participants were signalled to complete assessments throughout the day while in the paper-and-pencil condition participants completed assessments at any time and only once per day. These discrepancies could account for the differences found between the two conditions tested.

2.1.2 Challenges related to ESM

As discussed, there are many advantages to using ESM, however, there are also a number of challenges and limitations that should be considered.

2.1.2.1 Burden

ESM can be time consuming (for both researchers and participants) and requires a large amount of resources. Further, disruption caused by random time-sampling alerts may

cause distress which could potential bias the data. ESM should be piloted to ensure that it is feasible for studying the population of interest and that burden is not high. To decrease burden, studies using intensive frequencies of assessments may decrease the number of days included in the study and ESM diaries should be kept short. Palmier-Claus et al., (2011) recommend 30-60 items per ESM diary and that the total time to complete the diary should not exceed 2-3 minutes, therefore the majority of items in ESM diaries are often Likert Scales that are quick and easy to complete. To assess burden participants in the current research were asked how much they felt that the study influenced them (see Section 3.4.1.3 for results).

2.1.2.2 ESM items

Shiffman et al. (2008) highlighted that most questionnaires were not designed to assess momentary phenomena and have therefore been adapted for ESM studies or new measures have been created. Piloting adapted/new measures is important and validating a set of ESM measures that can be used for all ESM assessments of the same construct (e.g. mood) or disorder (e.g. BD) would be useful. It is also important to remember that the data collected using ESM is essentially still self-report data and is therefore open to the same limitations associated with self-reports e.g. memory biases. However, self-reports in ESM are given immediately or very close to when the phenomena occurred and so biases are less of a concern (Trull & Ebner-Priemer, 2013). Keeping ESM diaries short will help ensure assessments are answered as close to the time at which they occurred as possible.

2.1.2.3 Reactivity

A concern raised regarding ESM data is distortion by reactivity (Moskowitz et al., 2009; Palmier-Claus et al., 2011; Shiffman et al., 2008; Trull & Ebner-Priemer, 2013; Wenze & Miller, 2010). Reactivity is when the act of assessing a behaviour impacts on the behaviour

being assessed (Shiffman et al., 2008) and is therefore akin to the Hawthorn Effect (Roethlisberger & Dickson, 1939). A number of studies have found little evidence of reactive effects in ESM (e.g. Hufford, Shields, Shiffman, Paty & Balabanis, 2002) and Palmier-Claus et al. (2011) suggested that potential reactivity can be reduced by constructing the ESM diary so that general items are interspersed to disguise the research question and avoid providing only emotionally salient items e.g. contextual information about location could be interspersed with items assessing current mood/one's disorder . This was done in the current research (see Appendix 4 for ESM diary layout).

2.1.2.4 Compliance

ESM studies are likely to encounter missing assessments due to the nature of assessing experiences over several days, at several times and as participants try to go about their daily lives. If the missing data is missing due to the phenomena being tested (e.g. participants miss alerts because their mood is very low in a study of mood) then this could bias the data obtained (see Section 2.1.1.4 for details regarding missing ESM data). The current study tested this by asking participants to report times alerts were missed and reasons why at the end of each day (see Section 3.4.1.2 for results). Moskowitz et al. (2009) suggested that compliance may be increased by establishing a good working relationship with participants and ensuring participants understand that they are making a major contribution to research. Further, ensuring participants fully understand all study equipment and requirements and contacting participants during the study period may increase compliance. These steps were taken in the current research. While some studies have found that bipolar groups completed significantly fewer momentary assessments than controls (e.g. Myin-Germeys et al., 2003; Havermans et al., 2007), other studies have found similar rates of compliance between these groups (e.g. Knowles et al., 2007). Further, severity of

bipolar symptoms has been reported to have no effect on compliance (Havermans et al., 2007).

2.1.3 Conclusion

Traditional clinical assessments (e.g. retrospective interviews) cannot address the characteristic instability and dynamic nature of BD and neglect contextually and temporally sensitive information. Giving careful consideration to the ESM procedure used and the challenges faced by this methodology, ESM can provide an ecologically valid method for examining features of BD that traditional assessments fail to capture using multiple, frequent assessments of momentary phenomena. Study 1 (Chapter 3) used ESM to investigate mood management in BD.

2.2 Mood induction in bipolar disorder (BD): A review

2.2.1 Introduction

Mood induction (MI) provides a way to study emotion in humans by inducing mood in a controlled way. Manipulating mood in a controlled way using MI procedures (MIPs) may improve understanding of why some individuals experience mood episodes characteristic of BD, and what interventions may best aid these people. Special consideration must be given to the types of MIPs suitable for use with participants who have a diagnosis of BD in order to induce moods strong enough to represent a change from baseline mood but subtle enough to avoid inducing a mood episode.

To date, there have only been three papers published that have reviewed several MIPs (Martin, 1990; Gerrards-Hesse, Spies & Hesse, 1994; Westermann, Spies, Stahl & Hesse, 1996) but none of these reviews were specific to BD. Rather, 2 of these reviews focused on MIPs using non-clinical samples (Gerrards-Hesse et al., 1994; Westermann et al., 1996) and the other on studies using both clinical and non-clinical samples (Martin, 1990). Briefly, these

general reviews of MIPs found that 1) self-constructed rating scales (e.g. visual analogue scales) and standardized mood measures were the most commonly used measures of MI effectiveness; 2) MIPs that explicitly informed participants that an attempt would be made to manipulate mood were more effective than implicit MIPs and 3) overall film/story MIPs were the most effective MIPs for inducing both positive, and especially negative, mood. It was noted that results from explicit MIPs could have been compromised by demand characteristics. However, there is little empirical evidence that participants wish to guess and confirm experimental hypotheses (Berkowitz & Troccoli, 1986). Furthermore, explicit MIPs are more ethically sound given that participants are aware that their mood is being manipulated. As stated, these reviews did not focus on studies using people with BD and so caution should be taken when interpreting the conclusions drawn from these reviews in relation to MI in BD. Although there are a number of studies that have employed MIPs to study BD, no review for the induction of mood in BD exists to date. Therefore it seems timely that a review of the literature pertaining to MIPs with bipolar samples be conducted.

In October 2013 a systematic search of PsycInfo, Medline and Web of Science online databases was conducted to obtain relevant studies using MIPs with people with bipolar experiences. The search terms "Bipolar disorder" AND "mood induction" OR "mood manipulation" were entered and results were limited to studies using adults and published in peer reviewed journals in English language. After duplicates were omitted, the remaining 95 reference abstracts were examined and articles were selected that studied BD specifically (rather than general mood disorders) and included the induction of positive or negative mood. Although people with BD experience a range of complex mood states this review was only concerned with the induction of elated (positive) and depressed (negative) mood due to these mood states being key to diagnostic criteria for BD (APA, 2000). Searches were supplemented with relevant studies referenced in the articles obtained. A final sample of 17 papers focussing on MI in BD was obtained.

The Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986) is conceptualised as a measure of sub-syndromal symptoms of BD. Individuals with high HPS scores are at greater risk of developing BD (Kwapil et al., 2000). However, studies using analogue samples to examine hypomanic personality were not included in this review because these samples were essentially analogue and therefore the MIPs appropriate for use with these samples may differ from those appropriate for use with participants diagnosed with BD.

The studies reviewed are displayed in Table 6. Collectively the MIPs used in these studies are reviewed with specific regard to whether the MIP was explicit or implicit, the participant samples used, the mood states induced and how effective the MIPs were at eliciting in change in mood. Finally, the measures used to screen people with BD for clinically significant symptoms prior to MI are reviewed due to the importance of assessing pre-MI mood state in a mood disordered population to reduce the risk of adverse effects post-MI.

2.2.2 Procedures used for inducing mood in participants with BD

Table 6 displays information regarding the MIPs used with BD samples. A brief description of each MIP is provided in Table 7 (see Appendix 1 for the specific pieces of music and film used in MI studies of BD).

Table 6: MIPs for BD

MIP	Explicit Vs. Implicit	Study	Participants			Mood states induced			Significant mood change reported	
			BD	C	MDD	Positive	Negative	Neutral	Positive	Negative
Music + autobiographical recall	Explicit	Babakhani and Startup (2012)Talbot et al. (2009)	49	37	-	Yes	Yes	Yes	Yes	Yes
			28	28	-	Yes	Yes	Yes	Yes	Yes
Imagine +music	Explicit	Edge et al. (2013)	34	72	-	Yes	-	-	Not reported	Not reported
Film	Explicit	Gruber, Harvey & Gross (2012)Nutt and Lam (2011)	37	38	-	Yes	Yes	Yes	Not reported	Not reported
			28	30	-	Yes	Yes	-	Yes	Yes
		Lomax and Lam (2011)	30	30	-	Yes	-	-	Yes	-
		Gruber et al. (2011b)	23	24	-	Yes	Yes	Yes	Yes	No
		Lomax et al. (2009)	30	30	-	Yes	-	-	Yes	-
		Mansell and Lam (2006)	32	21	32	Yes	Yes	-	Yes	Yes
		Wright et al. (2005)	40	40	40	Yes	Yes	-	Yes	Yes
Go Task	Implicit	Roiser et al. (2009)Farmer et al. (2006)	15	19	-	Yes	-	-	Yes	-
			15	19	-	Yes	-	-	Yes	-
Visual image stimuli	Explicit	Gruber et al. (2013)	29	30	29	Yes	Yes	-	Not reported	Not reported
	Not reported	M'Bailara et al. (2009)	55	90	-	Yes	Yes	Yes	Yes	Yes
Autobiographical scripts	Explicit	Deckersbach et al. (2008)	9	17	-	-	Yes	Yes	-	Yes
Word-based memory task	Implicit	Mahli et al. (2007)	10	10	-	Yes	Yes	Yes	Not reported	Not reported
Visual word stimuli	Implicit	Mahli et al. (2005)	12	12	-	Yes	Yes	Yes	Not reported	Not reported

BD=bipolar disorder; C=controls; MDD=major depressive disorder/unipolar depression

Table 7: Description of MIPs for BD

MIP	Description of MIP
Music (with or without instruction)	Positively, negatively or neutrally toned music is played to participants with or without instructions to simultaneously try to alter mood in the instructed direction. Various pieces of music have been used for the induction of different mood states and studies have varied in whether a choice of music was presented or not.
Autobiographical recall	Participants are instructed to imagine situations from their lives that make them feel happy, sad or neutral. Additionally, participants are usually asked to think and feel as they would if they were in that situation.
Imagine	Imagine a dream coming true.
Film/story (with/without instruction)	Participants watch film clips or read stories designed to induce a happy, sad or neutral mood. Studies have used various clips and stories of varying lengths. The film/story MIP has been used with and without instructions to personally intensify the emotions elicited.
Go task in a reward paradigm (based on Johnson et al., 2005)	Participants perform a reaction time test (speeded response to eliminating lights) in 2 blocks, each lasting 2 minutes. No feedback is given during the first block but participants are informed that they were 'very fast' irrespective of their actual speed. During the second block, participants are told that a beep will sound when they respond accurately and quickly. Irrespective of actual performance, participants receive positive feedback 70% of the time.
Visual image stimuli	Six positive, six negative and six neutral photographs extracted from the International Affective Picture System are viewed by participants. Images selected were based on ethical criteria i.e. those unlikely to produce a very strong sensation of discomfort/anguish or those representing common phobias.
Autobiographical scripts	Participants prepare descriptions about sadness provoking/neutral events. Scripts are recorded for playback and last 30 seconds.
Word-based memory task	Participants complete a modified word based memory task involving nominating whether a target word (extracted from the Lang Affective Norms for English Words database) is contained within a previously presented word list.
Visual word stimuli	Participants are presented with 300 words from the Lang Affective Norms for English Words database in an emotional Stroop task (participants select ink colour of emotionally valent words). Participants are instructed to identify the ink colour of a presented word as quickly and accurately as possible. Following the Stroop task participants rate the affect of a subset of words.

2.2.2.1 Explicit versus implicit MIPs, participant samples and mood states induced

Table 6 displays information regarding whether MIPs used with bipolar samples were explicit or implicit, the participant samples used and the mood states induced. Only one study using implicit MIP with BD samples reported the effectiveness of the MIP based on visual analogue scales (VAS) scores (Farmer et al., 2006) and from Table 9 it seems mood change was less pronounced for this study than for those using explicit MIPs. Indeed, two general reviews of MIPs (not specific to BD; Martin, 1990; Westermann et al., 1996) reported that explicit MIPs were more effective than implicit MIPs. It is possible that the larger changes in mood reported by studies using explicit MIPs were due to demand characteristics. However, in the studies reviewed participants were naive to the study hypotheses. Further, when considering MIPs for clinical samples, such as BD, the possibility of demand characteristics must be weighted up against the ethical considerations associated with inducing mood in a mood disordered population. In this case, informed consent to mood manipulation is paramount.

All 17 studies have used a sample of people with BD along with a healthy control group for comparison. Two studies (Mansell & Lam, 2006; Wright et al., 2005) additionally used a sample of participants with unipolar depression, enabling the examination of cognitions specific to BD. All but one study (Deckersbach et al., 2008) used euthymic clinical groups.

Music + autobiographical recall, film and visual image stimuli MIPs have successfully induced *both* positive and negative mood states in BD samples. Although the word-based memory task and the visual word stimuli MIPs have been used to induce both positive and negative mood MIP effectiveness using these procedures has not been reported.

2.2.2.2 MIPs used and their effectiveness

Seventeen studies have used MIPs with bipolar samples and these studies have employed eight different MIPs to induce mood change (see Table 6). The majority of studies using MIPs with bipolar samples have used film MIPs. The film clips used can be seen in Appendix 1. Film MIPs were successful at inducing positive and negative mood in all studies apart from that by Gruber et al. (2011b). In this study separate repeated measures Analysis of Variances (ANOVAs) revealed that all participants reported significantly greater increases in positive affect to the positive films, however there was no main effect of film for ratings of negative affect.

Comparisons of MIP effectiveness are difficult due to the differing statistics reported (or lack thereof) regarding the success of the MIP. The reports given of MIP effectiveness differ depending on the measures of effectiveness (manipulation checks) used. The measures used to quantify mood change pre- to post-MI will now be briefly reviewed (Section 2.2.2.2.1) and how these measures have been used to assess successful mood change is reviewed in Section 2.2.2.2.2.

2.2.2.2.1 Measures of MI effectiveness (manipulation checks)

The measures used as manipulation checks are displayed in Table 8. Generally these measures are administered twice; immediately before and after MI. However some studies have measured mood more often (e.g. Nutt & Lam, 2011) or at set time intervals throughout the study (Talbot, Hairson, Eidelman, Gruber & Harvey, 2009).

In line with findings from general reviews of MIPs (Martin, 1990; Gerrards-Hesse et al., 1996), MIPs with bipolar samples have most commonly used self-constructed rating scales or standardised, self-report mood measures as manipulation checks. Few studies have used more than one manipulation check (e.g. Gruber et al., 2011b; Lomax & Lam, 2011; Lomax et al., 2009).Two studies used physiological measures (Gruber et al., 2011b; Mahli et

al., 2005). However, the physiological markers used may be better indictors of arousal than emotional change and cannot provide comment on specific emotions. Indeed, there is a general lack of evidence for physiological markers being a reliable measure of the experience of a mood change (e.g. Matheny & Blue, 1977; Johnston & Anastasiades, 1989; Nyklicek, Thayer & Van Doornen, 1997; Shapiro, Jamner & Goldstein, 1997; Etzel, Johnson, Dickerson, Tranel & Adolphs, 2006).

Two studies using MIPs with BD samples have not reported the measures used as manipulation checks (Gruber et al., 2012; Gruber, Purcell, Perna & Mikels, 2013) while other studies (Mahli, Lagopoulos, Sachdev, Ivanovski & Schier, 2007; Mahli et al., 2005) reported using mean ratings of affect following MI task but did not report the specific measures employed to rate affect. A measure of mood change for these studies could not be included in Table 8.

VAS are the most commonly used measure of mood change (used in 50% of BD studies). VAS require participants to place a mark at the point that best describes their current mood. Mood change values are taken by measuring (in mm) how far the participants' mark on the VAS post-MI has moved from the one made pre-MI (post-MI score minus pre-MI score). All studies using VAS have used a 100mm line with various anchors on the left and right ends. The only study to empirically justify the anchors used was that by Mansell and Lam (2006). They used labels adapted from the Internal States Scale (ISS; Bauer et al., 1991), which is a validated measure assessing the severity of manic and depressive symptoms. Using VAS has the advantage of providing a quantitative measure of mood change which is quick and easy to administer and can therefore can be repeated pre- and post- MI.

Table 8: Measures Used as Manipulation Checks

Measure	Studies using measure	Details of measure
Self-constructed rating scale= Visual Analogue Scales (VAS)	Babakhani & Startup (2012)	Seven 100mm horizontal lines from 0 ('not at all') to 100 ('extremely'). Each line headed with 'How ['tired' / 'anxious' / 'despondent' / 'sad' / 'happy' / 'angry' / 'apprehensive'] do you feel right now?'
	Nutt & Lam (2011)	100mm line with 'Saddest I've ever felt' written at one end and 'Happiest I've ever felt' at the other, with 'Neutral' in the middle.
	Lomax & Lam (2011)	See Mansell and Lam (2006).
	Roiser et al. (2009)	100mm line with 'Sad' on the left and 'Happy' on the right.
	Lomax et al. (2009)	See Mansell and Lam (2006).
	Deckersbach et al. (2008)	Degree of sadness experienced rated from 0 (absent) to 20 (maximum).
	Farmer et al. (2006)	100mm line on which participants indicated how happy or sad they felt.
	Mansell & Lam (2006)	Based on Wright et al. (2005) and adapted from the ISS. 100mm line with 'extremely low' written on the left and 'extremely high' written on the right, with 'neutral' in the middle.
	Wright et al. (2005)	100mm line with 'low' written on the left and 'high' on the right, with a mark indicating the central point.
Self-constructed rating scales = Affect Grid (Russell et al., 1989)	Gruber et al. (2011b)	Assessment of arousal from -4 ('extremely low arousal') to 4 ('extremely high arousal'), with 0 ('neutral') in the middle.
	Talbot et al. (2009)	Assessment of pleasure and arousal where pleasure is marked on the horizontal axis (-4='extremely unpleasant', 0='neutral' and 4='extremely pleasant') and arousal on the vertical axis (-4='extremely low arousal', 0='neutral' and 4='extremely high arousal'.

Self-constructed rating scales = Self Assessment Manikin (SAM)	M'Bailara et al. (2009)	Measurement of valence (pleasant/unpleasantness of image) and arousal (extent to which image was emotionally arousing) on separate 9-point Likert scales, where low scores indicate unpleasantness/low emotional intensity and high scores indicate pleasantness/strong emotional intensity.
Standardised mood measures (self-report)= Positive and Negative Affect Schedule (Watson et al., 1988)	Gruber et al. (2011b)	10-item short form (PANAS; Mackinnon et al., 1999) to assess positive and negative affect.
	Lomax & Lam (2011)	See Lomax et al. (2009).
	Lomax et al. (2009)	20-item measure of positive and negative affect rated on separate scales of 1 ('not at all') to 5 ('very much').
Standardised mood measures (self-report)= Altman Mania Scale (AMS; Altman et al., 1997)	Edge et al. (2013)	An amended version of the AMS was used to assess manic symptoms. Amendments to the AMS were: 'Sleep' item excluded; 'activity' item changed to 'excitement'; and response format changed from multiple choice to 7-point Likert scale ranging from 'not at all' to 'extremely'.
Physiological measures= Heart rate (HR), respiratory sinus arrhythmia (RSA), skin conductance response (SCR).	Gruber et al. (2011b)	HR was measured to assess cardiovascular activity, RSA to measure cardiac vagal tome/parasympathetic nervous activity and SCR to measure sympathetic nervous system activity.
Galvanic Skin Response (GSR)	Mahli et al. (2005)	GSR was measured to assess arousal.

2.2.2.2.2 The use of manipulation check measures to assess successful mood change

Comparing MIP effectiveness across studies is difficult due to the differing statistics reported (or lack thereof). For example, Mansell and Lam (2006) reported that their MIP was highly significant according to pre- and post-MI VAS scores, while M'Bailara et al. (2009) reported that valence and arousal differed significantly according to the type of image

viewed (positive, negative, neutral). However, only Talbot et al. (2009) actually reported the thresholds used to define a mood change according to the manipulation check (a change of at least +3 for happy MI and -3 for sad MI on an affect grid, scale 1-4). This was also the only study to report the percentage change in mood per group in each MI condition. They found that 58% of BD and 59% of controls met the threshold for mood change in the positive condition and 86% of BD and 65% of controls met the threshold for mood change in the negative condition. Five studies (Gruber et al., 2013; Edge et al., 2013; Gruber et al., 2012; Mahli et al, 2007; Mahli et al., 2005) did not report the effectiveness of the MIP at all. Reports regarding criteria set to define successful mood change are crucial to understanding MI success. The fact that none of the studies of MI in BD (except Talbot et al., 2009) have provided this information renders comparisons of MI success difficult, if not impossible. The studies displayed in Table 9 assessed mood change on 100mm VAS and therefore mean differences in mood pre- to post-MI could be compared. According to reported VAS scores, mean mood change was highest for positive MI when film MIP was used. For negative MI, music + autobiographical recall produced the highest mean mood change.

Table 9: MIP Effectiveness Based on VAS Scores

MIP & Study	MIP effectiveness (MD in mood scores pre- to post-MI)			
	Positive		Negative	
	Bipolar	*Control*	*Bipolar*	*Control*
Music + autobiographical recall				
Babakhani & Startup (2012)	H-VAS: 5.90 S-VAS: NS	H-VAS: 8.68 S-VAS: NS	H-VAS:-20.18 S-VAS: 25.60	H-VAS:-20.18 S-VAS: 25.60
Film				
Nutt & Lam (2011)Lomax & Lam (2011) Lomax et al. (2009) Mansell & Lam (2006) Wright et al. (2005) *Average*	VAS: 9.14 VAS: 10.73VAS:10.73 VAS: 9.44 VAS: 10.53 *10.11*	VAS: 11.92VAS: 15.13VAS: 15.13 VAS:11.57 VAS: 17.73 *14.30*	VAS: -2.93-- VAS: -16.87 VAS: -24.45 *-14.75*	VAS: -15.12 -- VAS: -10.25 VAS: -22.05 *-15.81*
Go Task				
Roiser et al. (2009) Farmer et al. (2006)	NR VAS: 7.92	NR VAS: 5.88	- -	- -

Autobiographical scripts Deckersbach et al. (2008)	-	-	NR	NR

2.2.3 Screening for clinical symptoms

Screening for significant symptoms is important because MI may work very differently if participants are already in a particularly high or low mood pre-MI and is especially important in studies using MIPs with BD samples because mood is being manipulated in a mood disordered sample. Therefore, if participants are already experiencing significant symptoms, risk of inducing an episode of BD is heightened. For these reasons, studies have set thresholds for inclusion that restrict symptomatology prior to MI. However, thresholds must be considered carefully because many people with BD experience mild residual symptoms of both mania and depression. Thus, setting thresholds too low will exclude a large number of participants and may not be representative of the general population, while setting thresholds too high risks including participants vulnerable to experiencing a mood episode following MI. Table 10 displays the various mood measures (and corresponding thresholds set) that have been used to screen participants for current significant symptoms of mania and depression prior to MI.

Edge et al. (2013) conducted a pilot MIP with a subset of participants from their main study. Screening measures and thresholds were not reported for the pilot study but for the main study were a Hamilton Rating Scale for Depression (HAMD; Hamilton, 1960) score of <7 and a Mania Rating Scale (MAS; Bech, Rafaelsen, Kramp & Bowig, 1978) score of <6. A number of other studies (Babakhani & Startup, 2012; Farmer et al., 2006; Roiser et al., 2009) have used measures of manic and depressive symptoms, namely the Altman Mania Scale (AMS; Altman et al., 1997) the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock & Erbaugh, 1961) and the Internal States Scale (ISS; Bauer et al., 1991), but have not reported whether thresholds were used to screen for significant symptoms and what these thresholds were. Therefore, it was not clear whether the mood measures included in these studies were used to screen for participants experiencing significant symptoms or merely as

a baseline measure of mood. For this reason these studies, and their respective mood measures, were not included in Table 10. The screening measures and thresholds for inclusion for all other studies using MIPs with bipolar samples are displayed in Table 10. Although measures employed and thresholds set for inclusion vary, generally all studies have only included participants in a normal mood state or with only mild residual symptoms. Only one study included participants with moderate depressive symptoms (Deckersbach et al., 2008) but did not report the threshold set for exclusion.

Although not used in the studies reviewed, a variation of the Hamilton Depression Grid (Grid-HAMD; Williams et al., 2008) should also be considered due to its ability to measure both the severity and frequency of symptoms (e.g. symptoms that are mild but frequent can be assessed against those that are severe but occasional). Thus, providing a more comprehensive and reliable measure of depressive symptomatology.

Table 10: Screening Measures for Clinical Symptoms

Screening measure and generally accepted thresholds	Studies using measure	Thresholds for symptom scores
Mania	Gruber et al. (2013)	≤7
Young Mania Rating Scale (YMRS; Young et al., 1978).	Gruber et al. (2012)	≤7
Thresholds: ≤7 remitted mood state and ≥7 clinically significant symptoms.	Gruber et al. (2011b)	≤7
	Talbot et al. (2009)	<7
	Deckersbach et al. (2008)	Low included
	Mahli et al. (2007)	≤6
	Mahli et al. (2005)	≤6
Mania Rating Scale (MAS; Bech et al., 1978).	Nutt & Lam (2011)	<5
Thresholds: < 7 normal mood, >15 clinically significant symptoms. Less is known about in-between.	Lomax & Lam (2011)	≤9
	M'Bailara et al. (2009)	≤4
	Lomax et al. (2009)	≤9
	Mansell & Lam (2006)	≤7
	Wright et al. (2005)	<6
Depression		
Inventory of Depressive Symptomatology (IDS-C; Rush et al., 1996).	Gruber et al. (2013)	≤11
	Gruber et al. (2012)	≤11
Thresholds: ≤11 remitted mood state and ≥11 clinically significant symptoms.	Gruber et al. (2011b)	≤11
	Talbot et al. (2009)	<12
Beck Depression Inventory (BDI; Beck et al., 1961).	Nutt & Lam (2011)	<16
	Lomax & Lam (2011)	≤16

Thresholds: 0-9 minimal symptoms, 10-16 mild symptoms and >16 moderate-severe symptoms.	Lomax et al. (2009) Mansell & Lam (2006) Wight et al. (2005)	≤16 ≤16 <15
Montgomery-Asberg Depression Rating Scale (MADRS; Montgomery and Asberg, 1979) Thresholds: 0-6 normal mood, 7-19 mild, 20-34 moderate and >34 severe.	M'Bailara et al. (2009)	≤12
Hamilton Rating Scale for Depression (HAMD; Hamilton, 1960). Thresholds: <4 normal mood state, 5-8 minor symptoms, 9-12 mild symptoms, 13-16 moderate symptoms and > 17 clinically significant symptoms.	Deckersbach et al. (2008) Mahli et al. (2007) Mahli et al. (2005)	Moderate included ≤6 ≤6

2.2.4 Conclusion

Special consideration must be given to the types of MIP suitable for use with participants who have a diagnosis of BD. If conducted appropriately, MIPs can extend our knowledge of BD and lead to the development of treatment interventions which aim to maximise the positive, and minimise the negative, consequences of experiencing extreme mood changes. This review suggests that explicit film MIPs are the most appropriate for inducing positive and negative mood changes in BD and that the VAS can provide a quick and easy measure of this change. Furthermore, observer-rated measures to screen for clinical symptoms prior to MI are recommended such as the HAMD and MAS which were designed to complement each other and have been used in a number of MIPs with bipolar samples. Thresholds for inclusion should be set to only include participants with very mild to normal baseline mood to reduce the risk of escalating symptoms and inducing a mood episode. Study 2 (Chapter 4) used a MIP based on these recommendations to examine mood management in BD.

2.3 Early warning signs (EWS) and coping strategies (CS) for BD: Study design

Study 3 (Chapter 5) used data from the National Institute for Health Research (NIHR) funded PARADES Psychoeducation Randomised Controlled Trial in a cross-sectional, survey design. Using a survey design, large numbers of participants can be questioned fairly quickly and easily. However, cross-sectional designs do not allow causal relationships to be established and the data collected using surveys is retrospective, self-report data and therefore open distortion by memory over time. Using closed questions allowed participants to respond to the questionnaires with greater ease and speed. Further, closed-questions are easier to score and are less reliant on interpretation for analysis than open-ended questions. However, closed-questions fail to capture idiosyncratic responses regarding personalised EWS and CS. Therefore, studying EWS and CS in this way may not capture the whole picture of how these factors impact on mood management.

2.4 Summary of methodological approaches

The 3 methodologies used were not viewed as competing alternatives but rather as complementary approaches providing triangulating evidence from different methodologies to test the validity of outcomes from any one study. ESM can address questions regarding mood variability and temporal associations between constructs in real time that MI and cross-sectional designs cannot. MI allows testing of specific hypotheses using manipulation of mood while holding other variables constant and gives a more powerful test of hypothesised causal relationships. Finally, the survey approach offers a broader examination of everyday behaviour in a larger sample, increasing external validity of findings. Note that the level of significance at which the alternative hypothesis would be accepted was set at 0.05 for all studies, in line with the majority of psychological research and based on Fisher's (1925) criterion.

2.5 Research objectives

The overall aim of the current research was to examine mood management processes in BD using a novel framework (the mood management model) based on the Self-Regulation Model (Leventhal et al., 1984). The psychological models reviewed (Section 1.3) suggest that we all go through the mood management processes proposed, but that transition through the stages of mood management differs for people with and without BD. By identifying stages at which people with and without BD differ further research can focus on these stages to examine the importance of concentrating treatment interventions at these specific stages for improving the course of BD. The mood management model was tested in 3 separate studies, the principal aims of which are outlined in Table 11 below.

Table 11: Principal Aims of the Current Research

Study	Aim
1 (ESM)	To examine whether there were differences between people with and without a diagnosis of BD in mood management processes during daily life. All 5 stages of the mood management model were examined using Experience Sampling Methodology (ESM).
2 (MI)	To examine whether there were differences between people with and without a diagnosis of BD in mood manage processes following an induced change in mood. Only the first 4 stages (detection, interpretation, intention and selection) of the mood management model were examined using a mood induction to induce mood in a controlled way.
3 (EWS+CS)	To investigate early warning sign (EWS) recognition, coping strategy use and evaluation of strategies for mood management in a large sample of participants with BD I and II. Only stages 4a (selection), 4b (implementation) and 5a (evaluation and reappraisal) were examined using a cross-sectional, survey design.

How these studies are linked with regard to recruitment and collaborative working is briefly described next before each study is presented separately in Chapters 3-5.

2.6 The structure of this PhD

Figures 9 provides a brief overview how recruitment into the studies contained in this thesis were facilitated by one another and by other studies active at The Spectrum Centre, Lancaster University (see Chapters 3-5 for details regarding recruitment). Additionally, Appendix 2 summarises how data was collected in collaboration with other PhD students to aid recruitment and reduce burden on participants.

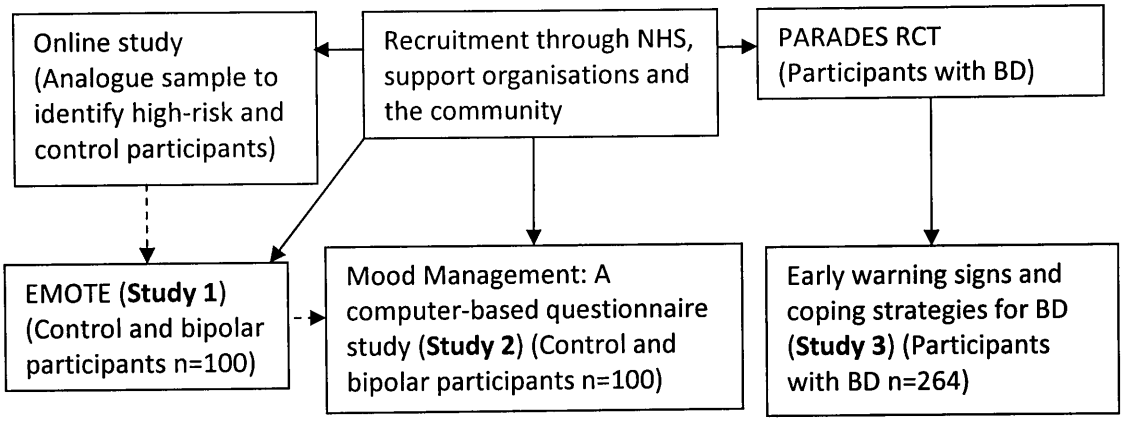


Figure 9: Recruitment across studies

CHAPTER 3: STUDY 1

Understanding mood management in daily life: An experience sampling study 'EMOTE (Everyday Observations of Thoughts and Emotions)'

3.1 Abstract

Based on the SRM (Leventhal et al., 1984), stages of mood management (detection, interpretation, intention and coping strategy selection and implementation, evaluation and repetition) were identified and examined.

Fifty bipolar and fifty control participants completed an experience sampling procedure in which they completed the same diarised questions about mood management 10 times a day for 7 days in response to a mobile text or wristwatch beep. Eight bipolar participants were excluded due to less than 30 alerts being completed within 10 minutes (therefore not constituting momentary responses).

Data from the final sample of 42 bipolar and 50 control participants was performed using multi-level modelling to account for the repeated measures structure of the data. Significant differences between groups were found at the detection/mood variability (stage 1), interpretation (stage 2) and coping (stage 4) stages of mood management. During a typical week of everyday life when bipolar symptoms were in remission, people with BD still experienced significantly more variability in mood than healthy controls. Following the detection of a mood change, people with BD interpreted more positive consequences, less personal control, less comprehensibility, a shorter duration of mood and used more self-dispositional appraisal styles than controls when current mood was controlled for in analyses. At the coping stage it emerged that the strategies selected to manage mood were not always the ones that were implemented. Further, people with BD appeared to be actively trying to manage mood, or were more aware of managing mood, compared to controls.

The differences found at these stages may indicate why symptom escalation occurs for people with BD. Potential implications for treatment are discussed. Future research following a formal power calculation is needed to confirm the effects found and test whether the differences found play a causal role in the escalation of mood into relapse.

3.2 Introduction

The SRM (Leventhal et al., 1984) provides a useful framework to describe how individuals process illness information and has been identified as a potentially useful framework for understanding bipolar mood fluctuation (Lobban et al., 2013). However, the specific stages have not been defined or tested with this population. To this end, a 5 stage model of mood management was proposed in the current research (based on the SRM), with the aim of identifying differences between people with and without bipolar mood changes at any of the identified stages (see Figure 10).

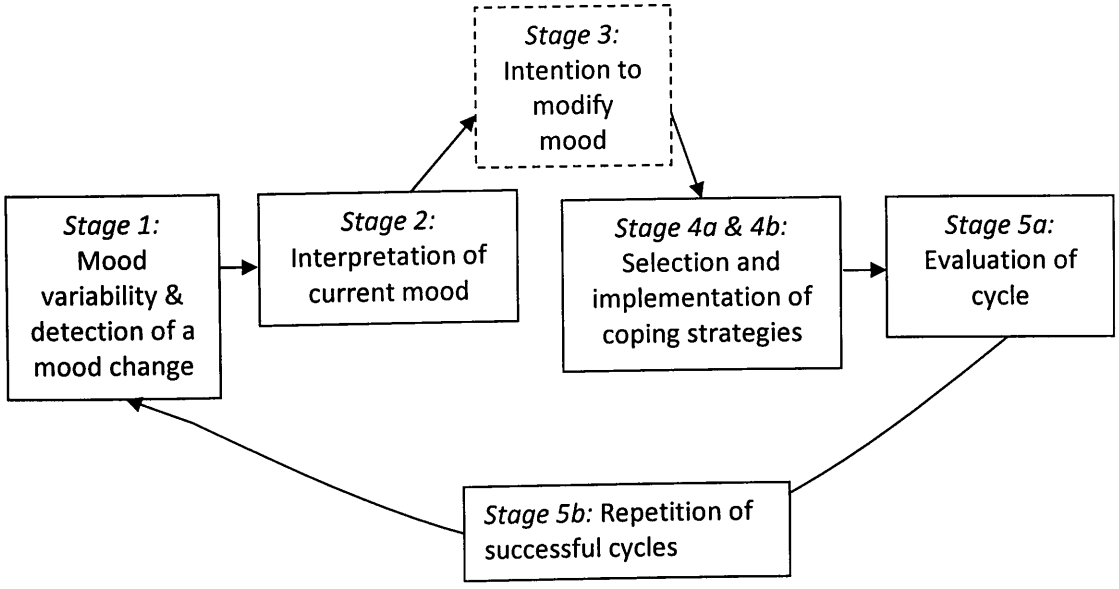


Figure 10: The mood management model

This study aimed to test all 5 stages of the mood management model using an Experience Sampling Method (ESM) to examine whether there were differences in this process of self-regulation in daily life between people with and without a diagnosis of BD. Traditional clinical assessments (e.g. retrospective interviews) cannot address the characteristic instability and dynamic nature of BD and neglect contextually and temporally sensitive information. ESM builds on traditional assessment methods by capturing thoughts, feelings and experiences in detail (through repeated assessments), as they occur (momentary assessments of current state) and in the context in which they occur (increasing ecological validity). For these reasons ESM can provide important insights into the features of BD as well as exploring the dynamic relationship between situational factors, experiences and symptoms in the process of mood management in BD. See section 2.1 for details regarding ESM and the potential limitations of using this methodology.

The literature regarding BD was reviewed in relation to each stage of the mood management model framework in Section 1.5 and so will not be repeated here. The specific pages of reference for the literature pertaining to each stage are listed below.

Stage 1-Mood variability: Section 1.5.1.1, page 78

Stage 2-Interpretation: Section 1.5.2, page 82

Stage 3-Intention: Section 1.5.3, page 91

Stage 4b & 4b-Selection and implementation: Section 1.5.4.2, page 101

Stage 5a-Evaluation: Section 1.5.5.1, page 104

Stage 5b-Repetition: Section 1.5.6, page 106

3.2.1 Aims and hypotheses

We are all hypothesised to go through the stages of mood management following a mood change. What was under scrutiny here was whether there are differences in this process of self-regulation in daily life between people with and without a diagnosis of BD.

The stages of mood management were tested separately, therefore discrete aims and hypotheses based on the existing literature reviewed in Section 1.5 are presented in Table 12 for each stage.

Table 12: Study 1 Aims and Hypotheses

Stage	*Hypotheses*
1. Mood variability	People with BD are more likely to show greater variability in mood than controls.
2. Interpretation	a) People with BD are more likely to report more positive and negative consequences related to mood than controls. b) People with BD are more likely to report less personal control over their mood than controls. c) People with BD are more likely to report more concern related to mood than controls. d) People with BD are more likely to report less comprehension regarding their mood than controls. e) People with BD are more likely to predict a longer duration of current mood than controls. f) People with BD are more likely to make positive self-dispositional appraisals than controls. g) People with BD are more likely to make negative self-dispositional appraisals than controls.
3. Intention	People with BD are more likely to intend to modify mood up when in a high mood than controls. Both groups are likely to intend to modify mood up when in a low mood.
Based on the gaps in the previous research into coping and mood management cycle evaluation and repetition (see Section1.5 for details), the current study also has the following aims:	
4a. Selection	To examine whether there is a difference between people with and without BD in the types of coping strategies (CS) selected to manage mood.
4b. Implementation	To examine whether there is a difference between people with and without BD in a) the types of CS implemented and b) whether the CS selected (at stage 4a) are implemented.
5a. Evaluation	To examine whether there is a difference between people with and without BD in evaluations of whether mood has changed in the direction intended following implementation of CS.
5b. Repetition	To examine whether there is a difference between people with and without BD in the rate of repetition of successful mood management cycles (i.e. cycles evaluated at stage 5a as changing mood in the intended direction).

3.3 Methods

3.3.1 Participants

3.3.1.1 Sample size

Power calculations for the multilevel data collected in ESM studies are very complex because sample size at all levels must be considered i.e. at the participant level the number of participants and at the observation level the number of observations per participant. Few studies using multi-level data have conducted formal power calculations prior to data collection for this reason (Dedrick et al., 2009) and consequently there is a lack of literature outlining methods for calculating power in ESM studies and little consensus regarding the utility of doing so. Based on previous studies using ESM which have used sample sizes of around 30-40 participants per group (e.g. Bylsma, Taylor-Clift & Rottenberg, 2011; Havermans et al., 2010; Husky, Grondin & Swendsen, 2004; Myin-Germeys et al., 2003), the current study aimed to recruit 50 participants per group to allow for expected attrition rates of up to 20% during the study (e.g. Depp et al., 2010; Havermans et al., 2007; Havermans et al., 2010). A sample size of 100 (50 per group) was chosen for pragmatic reasons such as the time available for recruitment, constraints on resources and not wanting to increase burden on participants by collecting responses above a certain threshold. Further, if group differences could not be found with this sample size the clinical significance of such differences would be questionable i.e. the aim of this research was to detect differences between people with and without BD that were robust enough to be detected with a sample of 100 participants. It should also be noted that while there were 100 participants, each participant completed the study measures 70 times across the study week and therefore the maximum total number of responses was 7000.

3.3.1.2 Recruitment

Participants were recruited into an online questionnaire study 'Is mood linked to a good night's sleep?' (See Appendix 2 for overview of PhD structure and my role in various studies). This study provided a means of identifying potentially eligible participants for the current study by asking participants to record any current or past mental health issues or diagnoses and to complete the HPS (Eckblad & Chapman, 1986). Participants were recruited into the online study through NHS services, support organisations and the wider community. The online study was presented to health professionals and service users and advertised through posters, email and social networking sites. To reach target numbers, further participants were recruited directly into Study 1 through the Spectrum Centre participant panel, mail outs from GP surgeries across the North West and through collaborative presentations with other studies recruiting from the Spectrum Centre at Lancaster University. All participants were directed to the online study so that HPS scores could be collected. See Appendix 3 for final recruitment numbers.

3.3.1.3 Inclusion and exclusion criteria

The inclusion and exclusion criteria for the current study are presented in tables 13 and 14.

Table 13: Study 1 Inclusion Criteria

Group	Inclusion criteria
General (BD and control)	• No current manic, hypomanic, mixed affective or major depressive episode currently or within the 4 weeks prior to baseline assessment, according to Structured Clinical Interview for DSM-IV Life (SCID-Life; First et al., 1997) scores (to ensure that participants were euthymic). • No current suicide plans or high suicide intent to avoid adverse reactions to the study procedure. • No physical brain injury due to difficulties in diagnosing BD. • Not a night shift worker due to potential disruption to routine. • Able and willing to give written informed consent to the study as required by ethics committees. • Able to communicate in written and oral English to a sufficient level to allow the participant to complete the measures because the current measures have not been validated in other languages.

	• Aged 18 years old or over due to BD diagnostic validity queries in children and adolescents.
BD	• Structured Clinical Interview for DSM-IV (SCID; First et al., 1997) verified diagnosis of primary BD I or II.
Control	• A score of <0.5 SD above the sample mean on the Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986) to exclude people with hypomanic personality which may predispose an individual to BD (Kwapil et al., 2000).

Table 14: Study 1 Exclusion Criteria

Group	Exclusion criteria
Control	• Lifetime occurrence of a manic or mixed affective episode because the experience of these mood states indicates a likelihood of meeting research diagnostic criteria for BD I. • Lifetime occurrence of a hypomanic *and* depressive episode because the experience of both of these mood states indicates a likelihood of meeting research diagnostic criteria for BD II. • Lifetime clinical diagnosis of a serious and enduring mental health disorder i.e. BD I or II, schizophrenia, personality disorder, dementia. • Any other mental health problem in the last 2 years (a sufficient amount of time to assume any mental health problems are not current). • A diagnosis of a sleep disorder/significant sleep disturbance in the last month due to potential impacts on mood.

3.3.1.4 Sample description and representativeness of the general population

Table 15 displays the socio-demographic data for the current control and bipolar samples.

Table 15: Study 1 Control and Bipolar Socio-Demographic Data

Descriptive	Control eligible (n=50)	Bipolar eligible (n=42)	Test statistic	df	p-value
Gender ratio (M/F)	10/40	16/26	X^2=3.69	1	0.06
Age, mean (SD)	37.64 (9.91)	43.95 (12.74)	t=-2.67	90	0.01
Highest level of education, n (%)			X^2=13.92	2	<0.001
Secondary	2 (4%)	11 (26%)			
Further	8 (16%)	12 (29%)			
Higher	40 (80%)	19 (45%)			
Employment status, n (%)			X^2=24.78	1	<0.001
Working (Paid PT/FT*)	43 (86%)	15 (36%)			
Not working	7 (14%)	27 (64%)			

Marital status, n (%)			X^2=6.53	2	0.04
Single	12 (24%)	15 (36%)			
Married/Cohabiting	34 (68%)	18 (43%)			
Separated/Divorced/Widow	4 (8%)	9 (21%)			
Living arrangements, n (%)			X^2=7.83	2	0.02
Partner with/without others	33 (66%)	18 (43%)			
Alone	6 (12%)	15 (36%)			
Other	11 (22%)	9 (21%)			
Nationality, n (%)			X^2=1.14	1	0.29
British	48 (96%)	38 (90%)			
Other	2 (4%)	4 (10%)			

**PT=part time, FT=full time*

3.3.1.4.1 Representativeness of the control sample (socio-demographics)

According to the Office of National Statistics 51% of the UK population is female (2011) and the median age of the population is 39.9 years (2010). The employment rate for those aged from 16 to 64 was 70% in November 2011 to January 2012. In 2010 48% of the population of England and Wales were married and 87% of the population described themselves as belonging to a white ethnic group. Thus, the number of female participants, participants in employment and participants married was higher in the current sample than would be expected within the general population. Mean age and ethnicity was representative of the general population.

3.3.1.4.2 Representativeness of the bipolar sample (socio-demographics)

The mean age of the bipolar sample in the current study was similar to that reported previously in large cohorts (*n*=1000-3000) of people with BD (Kogan et al., 2004; Kupfer et al., 2002). Employment status in the current sample represents what would be expected in the general population of people with BD (see Section 1.2.4 for details). In the line previous reports (Kogan et al., 2004; Suppes et al., 2001) there was little difference between the number of people with BD who were married/cohabiting or single in the current sample. The

ethnicity of the current sample was representative of the general population of people with BD (Kogan et al., 2004; Suppes et al., 2001).

3.3.1.4.3 Representativeness of the bipolar sample (clinical data)

Table 16 displays the clinical data for the bipolar sample only. The mean age of BD diagnosis was 32 years and the mean number of days since last episode was approximately 1 year. According to scores on the SCID Life (First, Spitzer, Gibbon & Williams, 1997) administered at baseline, no participants were in an episode of BD nor met criteria for alcohol or substance disorder. The majority of the bipolar sample (95%) were taking some form of medication.

Prevalence rates of BD I are higher than BD II (APA, 2000) and additional axis I disorders are common in BD (Merikangas et al., 2007). Therefore the higher proportion of BD I compared to BD II and the prevalence rates for additional axis I disorders in the current sample were expected. The mean age of BD onset in the current sample was higher than previously reported (e.g. Kogan et al., 2004; Oswald et al., 2007; Suppes et al., 2001). In line with previous findings, the majority of people with BD were expected to be taking some form of medication (Kupfer et al., 2002; Suppes et al., 2001) and to have received some form of treatment (Merikangas et al., 2007).

Although the numbers of depressive and manic/hypomanic episodes reported in the current study were comparable to those reported previously (Suppes et al., 2001), these participants had to present for outpatient treatment to be recruited and the participants in the current study had to be willing to participate in an ESM study. Therefore, these participants may not be entirely reflective of the general population of people with BD (e.g. those with a recent diagnosis or first time episode) but may represent a more chronically unwell sample of people with BD.

Table 16: Study 1 Bipolar Sample Clinical Descriptives

Descriptive	n	%
BD type, I/II	32/10	76/24
BD I with mood congruent psychosis		
No	13	31
Yes	29	69
Additional axis I diagnoses		
No additional axis I diagnosis	9	21
Current additional axis I diagnosis	25	60
Past additional axis I diagnosis	8	19
Treatment focussing on MM* (n, %)		
No treatment	16	38
Current treatment	7	17
Past treatment	15	36
Information missing	4	10
No. depressive episodes		
0	2	5
1-6	14	33
7-11	6	14
12-29	14	33
30+	6	14
No. manic/hypomanic episodes		
1-6	18	43
7-11	7	17
12-29	11	26
30+	6	14
No. hospitalisations		
0	15	36
1-6	22	52
7-11	2	5
12-29	3	7
Medication		
No medication	2	5
Monotherapy	10	24
Combination therapy	30	71
Antidepressant	16	
Lithium	10	
Valproate	10	
Carbamazepine	3	
Lamotrogine	6	
Benzodiazepines/Hypnotics	10	
Antipsychotics	30	
Meds for physical problems	17	

*MM=mood management

3.3.2 Measures

3.3.2.1 Socio-demographic measures

1. Socio-demographic data sheet (available on request)

All participants were asked to provide general information such as age, employment status and education. Participants with BD were also asked to provide some clinical details such as time since last episode, current medication and number of previous episodes.

3.3.2.2 Screening measures

1. The Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986)

The HPS (available on request) is a 48-item true/false questionnaire used to define people as having hypomanic personality. People with hypomanic personality show increased positive mood and energy, more depression and greater risk of BD (Jones & Day, 2008). The HPS was used to specify participants as controls (participants who scored <0.5 standard deviations above the sample mean on the HPS).

2. The Structured Clinical Interview for the DSM-IV (SCID; First et al., 1997)

The SCID was used to confirm that the clinical sample met research diagnostic criteria for BD I or II, to verify any additional DSM-IV Axis I psychological disorders and to screen control participants. SCID interviews were administered over the telephone due to participants being located throughout the North of England. There was 100% agreement between raters regarding the presence (for the bipolar group) or absence (for the control group) of a SCID DSM-IV diagnosis of BD and additional Axis I disorders. There was a discrepancy over the type of BD for one of the bipolar participants, with two interviewers rating bipolar II and one interviewer bipolar I. Following discussion within the research team, it was agreed by all raters that this participant met criteria for bipolar II disorder. SCID data for all participants rated as bipolar II was then checked by the research team to ensure

agreement on correct rating. Note that the SCID-IV was used because it was current at the time of this study (as was the DSM-IV referred to throughout this thesis).

3. SCID-Life (First et al., 1997)

The SCID-Life (available on request) is a shortened version of the SCID which was administered at baseline to assess participants' mood during the previous 4 weeks. It incorporates the Hamilton Depression Rating Grid (Grid-HAMD; Williams et al., 2008) and the Bech-Rafaelsen Mania Scale (MAS; Bech et al., 1978) which provided additional measures of any depressive or manic symptoms present at baseline. Inter-rater agreement was checked only for whether participants received a score of <4 at baseline, indicating the absence of a mood episode and study eligibility. There was 100% agreement that participants did not meet SCID criteria for either a manic, hypomanic or depressed episode prior to, or at, baseline assessment.

3.3.2.3 ESM diary measures

The ESM diary (see Appendix 4 for a copy of the ESM diary) contained the following measures to assess the 5 stages of mood management, along with items relevant to two other PhD theses. Only measures and procedures relevant to the current study are reported (see Appendix 2 for the general focus of other theses and the potential impact of the related diary items on responses to the current items). Some questions in the diary were included as open questions, while other appeared as closed questions. This was partly a pragmatic decision based on keeping length of the diary short (the diary was designed to be completed within 2-3 minutes) to obtain 'within the moment' responses and the time it would take to code open questions.

3.3.2.3.1 Stage 1: Detection (Mood variability)

Mood items for the ESM diary were collated based on factor analysed items used in previous ESM research assessing mood with clinical samples (e.g. Havermans et al. 2010) and validated measures of mood i.e. the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988), the Internal State Scale (ISS; Bauer et al., 1991), the SCID (First et al., 1997), the Mood Disorders Questionnaire (MDQ; Hirschfeld et al., 2000) and the HPS (Eckblad & Chapman, 1986). Three items were included to represent positive affect (cheerful, energetic and confident) and three to represent negative affect (bad about myself, down and guilty). All items were rated on a 7-point Likert scale (1=not to 7=very).

Correlations between the positive affect (PA) and negative affect (NA) items for each group were examined. Pearson's (1900) correlations were strong enough to suggest that the three PA items were measuring similar constructs and similarly for the NA items (see Table 17 below). Therefore, mean total PA and NA were used to compare variability in mood between groups (see Section 3.4.3.2 for details of analyses).

Table 17: ESM Mood Item Correlations

Mood item	Control	Bipolar	All ppts
Cheerful + Energetic	0.65	0.70	0.68
Cheerful + Confident	0.59	0.79	0.71
Energetic + Confident	0.58	0.65	0.63
Bad + Down	0.60	0.79	0.77
Bad + Guilty	0.57	0.83	0.81
Down + Guilty	0.47	0.73	0.70

3.3.2.3.2 Stage 2: Interpretation

3.3.2.3.2.1 The Brief Illness Perception Questionnaire (BIPQ; Broadbent et al., 2006)

The BIPQ is a 9-item questionnaire which assesses cognitive and emotional illness representations on Likert scales. The dimensions assessed are; consequences, timeline, personal control, treatment control, identity, illness comprehensibly, cause (cognitive representations), concern and emotions (emotion representations).

The BIPQ was adapted in the current research to be relevant for use with both a control and bipolar sample rating current mood. This adaptation is consistent with previous studies in which the terms used in the BIPQ have been adapted to suit the participants responding to it (Lobban et al., 2005a; Lobban et al., 2013). The dimensions deemed relevant to the current research were consequences, personal control, concern (emotional response), comprehensibility, time line and cause. Treatment control was not included because control participants were unlikely to use treatments to control mood and therefore comparisons between control and clinical samples on this dimension would be impractical. The identity dimension was not examined because participants were asked to identify current mood for examination of mood variability (PA and NA items included in the diary) and therefore were told what to identify. The emotional representation of the BIPQ includes concern and emotions. The emotions dimension was excluded because this thesis looked at how people think and act in relation to mood which would be difficult to distinguish from emotions. It did not make sense to ask 'how does your current mood affect you emotionally?' Concern was included because it was more distinct from mood which was defined as positive/negative affect. Cause was assessed using the Hypomanic Interpretations Questionnaire (HIQ; Jones et al., 2006a) and the Interpretations of Depression Questionnaire (IDQ: Jones & Day, 2008) because the open-ended style question included in the BIPQ would have been difficult to analyse quantitatively.

- Example amended BIPQ item (personal control dimension):

My mood is controllable by me...	Not									Very
	1	2	3	4	5	6	7	8	9	10

3.3.2.3.2.2 The Hypomanic Interpretations Questionnaire (HIQ; Jones et al., 2006a) and the Interpretations of Depression Questionnaire (IDQ: Jones & Day, 2008)

These are 10-item scales in which descriptions of situations related to elevated (HIQ) or low (IDQ) mood are followed by two types of appraisals of these situations. These are normalising hypomanic appraisals (HIQ-N) or self-dispositional hypomanic appraisals (HIQ-H)

in the HIQ and normalising depressive appraisals (IDQ-N) or self-dispositional depressive appraisals (IDQ-D) in the IDQ. Participants are asked to rate to what extent they would be likely to attribute their mood to each appraisal from 'Not at all' to 'A great deal'. Only one HIQ and one IDQ item were included in the diary in order to keep the number of items and response times low. This is recognised practice for ESM studies because the repetition of items accounts for the small number of items at one time point. The items included in the diary were based on PCAs of these measures. The PCA extracted the items that best represented the concepts being tested (see Appendix 6 for details of PCA).

- The HIQ and IDQ items appeared in the ESM diary as follows:

	Not at all	Somewhat	Quite a Bit	A great deal
a) HIQ				
If I felt in high spirits and full of energy, I would probably think it was because:				
[HIQ-H] I am a talented person with lots to offer	1	2	3	4
[HIQ-N] Things happen to be going well for me at present	1	2	3	4
b) IDQ				
If I felt down on myself, I would probably think it was because:				
[IDQ-D] I am a bad person, even towards myself	1	2	3	4
[IDQ-N] Current problems are leading me to be rather hard on myself	1	2	3	4

3.3.2.3.3. Stage 3: Intention

Due to a lack of pre-existing measures of intention to change current mood during an ESM study, this measure was designed specifically for the current study. Participants were asked "Would you like to make your current mood Go up/Go down/Stay the same". Feedback from a pilot study suggested that this item was appropriately worded and understood.

3.3.2.3.3.1 Measuring current mood

A single measure of current mood was needed (opposed to the separate PA and NA variables described previously in section 3.3.2.3.1) for inclusion in some of the multi-level

models used for analysis. The literature suggests PA and NA are separate dimensions and are not always negatively correlated (e.g. Russell & Carroll, 1999). Therefore, it was not appropriate to combine PA and NA items to create a single mood item. Thus, participants' responses to the single-scale 'overall happy' item (see below) were used as a measure of overall current mood. Overall happy scores 1-7 were categorised into low, medium and high mood where scores of 1 and 2 represented low mood, 3, 4 and 5 represented medium mood and 6 and 7 represented high mood.

- Example of the 'overall happy' item

Overall, I'm feeling happy...	Not			Moderate			Very
	1	2	3	4	5	6	7

3.3.2.3.4 Stage 4a: Selection

Due to a lack of pre-existing measures of CS selection during an ESM study, this measure was designed specifically for the current study. Participants were asked to respond to the diary item: "I intend to make my mood go up/down/stay the same by (please state the main thing you intend to do)". Feedback from a pilot study suggested that this item was appropriately worded and understood. Current mood was measured in the same way as for intention.

3.3.2.3.5 Stage 4b: Implementation

Due to a lack of pre-existing measures of CS implementation during an ESM study, this measure was designed specifically for the current study. Participants were asked "Since the last text alert, have you done anything with the intention of modifying your mood (make your mood go up/go down/stay the same)? If so, what is the main thing you have done?" Feedback from a pilot study suggested that this item was appropriately worded and understood. Current mood was measured in the same way as for intention.

There was no existing quantitative coding system for open-ended responses regarding CS in BD. Therefore, a system for categorising CS was developed for the current

study (available on request). By having discrete categories, group differences in the type of CS selected/implemented and the strategies selected/implemented most often could be analysed. Further, categorising responses numerically allowed a comparison of whether participants implemented the strategy that they selected i.e. if the category numbers matched. See Appendix 7 for the final codebook.

3.3.2.3.6 Stage 5a: Evaluation

Due to a lack of pre-existing measures of evaluation of mood management cycles during an ESM study, this measure was designed specifically for the current study. Participants were asked "What impact has this [implementation response] had on your mood? (please underline)...Lifted my mood/Made my mood go down/No impact". Feedback from a pilot study suggested that this item was appropriately worded and understood.

3.3.2.3.7 Stage 5b: Repetition

No specific item was included in the ESM diary to test the repetition stage of mood management. The intention and evaluation items were used to assess the frequency of successful mood management cycles over the study week and the implementation item was used to determine the types of CS used during successful cycles (See Section 3.4.3.7 for details of how these items were used in analysis).

3.3.3 Procedure

Approval was granted from the Lancaster NHS Research Ethics Committee (10/H1015/76). The study was then peer reviewed before being adopted by the Mental Health Research Network (MHRN) (59258).

Following referral, participants were allocated a researcher (HR, KH or FB) with whom all interviews and appointments took place (see Appendix 2 for an overview of how

the research was conducted in collaboration). Initial contact was made via telephone and verbal consent was taken to conduct an initial pre-screen (available on request) leading to a full screening interview (available on request) and relevant screening questions from the SCID (First et al., 1997) if appropriate. If participants answered positively to any of the individual SCID screening questions, the corresponding sections of the SCID interview were also completed. Ineligible participants were offered the opportunity to join the Spectrum Centre Participants Panel so that they could be informed of future research. For eligible participants, a study appointment was made.

At the baseline appointment, written informed consent (available on request) was taken and participants were screened for any mood episode in the 4 weeks prior to this appointment using the SCID Life (First et al., 1997) mood experiences interview. Participants with BD who could not be included due to scores above the threshold (SCID Life score >4 indicating more than normal mood symptoms) were offered the opportunity to take part once their symptoms had reduced.

A 'briefing session' then took place to explain the equipment and procedure to the participant. ESM was used to assess momentary responses to questions related to the self regulation of mood. Participants were provided with seven A5 ESM diaries (one for each day of the study) containing both open and closed questions related to 3 separate PhD studies on mood in BD. A copy of the ESM diary response sheet including the questions related to the current study can be seen in Appendix 4. The researcher went through the layout of the ESM diary and explained how and when to fill it in. Participants were also provided with an information book detailing the study procedure.

Participants used either a mobile phone (either the participant's own or one provided by the research team) or an Ironman Data Link watch (provided by the research team) as the signalling device (5 bipolar and 5 control participants chose to use a watch and the remaining participants used mobile phones). In response to either text alerts from a

mobile phone or beeps from a watch, participants completed the same diary questions 10 times a day for 7 days. For participants using a mobile phone, their number was synchronised with a Google Mail account which was then synchronised with a Google Mail calendar containing the ESM schedules stored as "events". At the time of the "event" the participant received a text message reading "Please fill in your diary". All alerts (mobile and watch) were programmed to occur between 7:45am and 10:15pm, at semi-random intervals. The minimum gap between alerts was 24 minutes and the maximum was 159 minutes, with an average gap of 90 minutes. Three different ESM schedules were used (one by each researcher).

Participants were asked to record the time at which they completed each diary entry. Previous studies (e.g. Delespaul, deVries, van Os, 2002; Peters et al., 2012; Thewissen, Bentall, Lecomte, van Os & Myin-Germeys, 2008) have excluded participants if they responded to less than 33% of alerts within 15 minutes. This study was more conservative and excluded participants who completed fewer than 30% of alerts within 10 minutes of the signal because responses outside 10 minutes were not deemed to be 'within the moment' assessments and could have been prompted by something other than the study signal. For this reason, participants were advised to complete the diary as soon as possible following an alert but to leave it blank if they were not able to complete it within 10 minutes. In such cases, participants were asked to fill in the reason for the missed response in the back of the diary and to wait until the next alert to respond. Participants were asked to keep the mobile phone or watch with them at all times and to record periods when these devices were not with them.

Verbal consent was obtained to contact the participant by phone during the study week to provide support, increase motivation and arrange a final appointment. Following completion of the study, the allocated researcher met the participant for the final time to

collect the study equipment, debrief the participant and give them a payment of £10 as a thank you for taking part.

3.4 Results

3.4.1 The ESM procedure

3.4.1.1 Participant eligibility according to ESM responses

Fifty control and 50 bipolar participants completed the ESM procedure. Eight bipolar participants were excluded due to less than 30% of alerts being responded to within 10 minutes. There was a total of 4197 eligible responses (≥30% within 10 minutes) from 92 participants (50 control and 42 bipolar). Fifty six percent of the eligible responses came from controls and 44% from bipolar participants. An independent t-test revealed that there was no significant difference between groups in the mean number of eligible responses and the range was very similar (Table 18).

Table 18: Mean Number of Eligible ESM Responses per Participant, per Group

Descriptive	Control (n=50)	Bipolar (n=42)	t (df)	p-value	95% CI
Mean (SD)	47.26 (10.91)	43.69 (11.32)	1.54 (90)	0.13	-1.05, 8.19
Range	24 - 65	24 - 68			
Total eligible responses	2362 / 4197	1835 / 4197			

Comparisons were made between the eligible and ineligible bipolar samples to identify whether any differences in socio-demographic or clinical characteristics could explain why 42 bipolar participants were compliant with the ESM procedure and 8 were not. No significant differences were found in clinical variables, but there was a significant difference between the eligible and ineligible samples in living arrangements with nearly half the eligible sample living with a partner compared to only a quarter of the ineligible sample. See Appendix 8 for ineligible sample description and analysis.

3.4.1.2 Missing data

Participants were asked to record periods when they were unable to fill in the ESM diary. Table 19 displays the reasons why data was missing for each group. Sixty six percent of the missing data from controls and 43% from bipolar participants was accounted for. Controls missed alerts most often due to work or study, while bipolar participants missed alerts most commonly due to being asleep or resting. Given the difference in the number of participants in employment between control (86%) and bipolar (36%) samples, this difference is not surprising. Less than 1% of missing data was due to being mentally unwell and these 2 responses both came from the same bipolar participant. Therefore, missing data was unlikely to be due to changes in mood which may bias results, but rather due to the other factors listed below. The most common reasons for missed alerts in both samples were sleep, socialising, work and equipment problems.

Table 19: Reasons for Missing ESM Responses

Reason missing	C n (% of total missing)	BD n (% of total missing)
Sleep/Rest	104 (9%)	228 (14%)
Socialising/Leisure e.g. Face-to-face/phone interaction, watching a film, going to theatre	104 (9%)	163 (10%)
Work/Study	205 (18%)	95 (6%)
Problem with equipment/Method e.g. Didn't hear text, Google error, completed before alert, phone not with participants, time not filled in.	152 (13%)	86 (5%)
Housework/ Daily errands including shopping, child care	25 (2%)	24 (1%)
Travelling e.g. driving, public transport	96 (8%)	36 (2%)
Exercise including dog walk / walking	32 (3%)	31 (2%)
Mentally unwell e.g. high / low mood	0	2 (<1%)
Physically unwell e.g. headache, back pain	0	10 (1%)
Unwell but not stated in what way	0	1 (<1%)
Eating i.e. mealtimes	9 (1%)	2 (<1%)
Personal hygiene e.g. Shower, bath, getting dressed	9 (1%)	10 (1%)
Appointment e.g. GP, funeral, bank	6 (1%)	26 (2%)
Unable to concentrate	6 (1%)	3 (<1%)
No reason stated	390 (34%)	948 (57%)
Did not start study i.e. Participant didn't fill in any diary entries	0	70 (4%)
	Control n (% of total alerts)	*Bipolar n (% of total alerts)*
Total missing	1138 (32%)	1665 (48%)
Total eligible	2362 (68%)	1835 (52%)
Total beeps	3500	3500

3.4.1.3 The influence of ESM on mood

At the end of each day, participants were asked to rate how ordinary the day was and how much the study had influenced their mood that day (see questions below).

- Example of diary questions:

	Not			Moderate			Very
It was an ordinary day	1	2	3	4	5	6	7
Filling in the booklet influenced my mood today							
	1	2	3	4	5	6	7

Table 20 shows that both groups viewed the study week as moderately ordinary. Although there was a statistically significant difference between groups in how ordinary they perceived the week to be, responses given at debrief indicate that the week was not judged to be less ordinary due to mood. At debrief, participants reported that they had reduced their scores for how ordinary the day was if events such as parties and disagreements had occurred. These events are part of normal life and so how ordinary the week was may have been under-rated. Both groups explicitly reported that the study did not have much influence on their mood. Again, there was a statistically significant difference between groups in how much influence they perceived the study to have on mood. It is important to acknowledge that the bipolar sample perceived the week as less ordinary *and* reported being more influenced by the study, which in combination could impact on findings.

Table 20: The Influence of ESM on Mood

Item	Group	Mean score (SD)	Range	T-test
Ordinary	Control	4.44 (1.76)	1-7	t (588)=3.45, p=0.001
	Bipolar	3.95 (1.70)	1-7	
Influenced	Control	1.99 (1.25)	1-6	t= (587)=-4.38, p<0.001
	Bipolar	2.53 (1.76)	1-7	

3.4.2 Sample descriptive statistics

Although the study aimed to match control and bipolar samples on age, gender and employment status, this was not possible due to time constraints on recruitment and the

difficulty of recruiting into an ESM study. Therefore, both groups were recruited simultaneously and so matching on socio-demographic characteristics was not possible.

Table 15 displays the socio-demographic variables for the final sample (n=92). Although there were significant differences between groups in age, education, employment status, marital status and living arrangements these variables were not included in the general multilevel model (MLM; see Section 3.4.3.1) for several reasons. Age and gender were unlikely to affect the outcome variables tested and adding them to the models for stages 1 (detection) and 2 (interpretation) decreased the goodness-of-fit according to the Akaike Information Criterion (AIC) value (measure of goodness-of-fit for MLM). The literature suggests difficulties with employment are inherently linked to BD (see Gilbert & Marwaha, 2013 for a review) and therefore controlling for employment status may, in part, control for having BD. Furthermore, the current study was exploratory in nature with a modest sample size, therefore including too many variables in the models would have made the models unstable. For these reasons, only variables directly associated with the current hypotheses and those necessary for appropriate analysis of ESM data (see Section 3.4.3.1) were included. The limitations of not including covariates in the MLM will be discussed.

3.4.3 Analysis of the mood management model

3.4.3.1 Formulating a general MLM

Multilevel linear and logistic regression models were applied to the ESM data to examine the effects of BD on each stage of mood management. Data was analysed in R statistical software (R Development Core Team, 2011) using MLM which is appropriate for the nested structure of the ESM data (participants' responses nested within day, within participant). A general MLM was formulated in which participant-level variance was estimated to account for inter-individual variability. The model was adjusted for diurnal and hourly variations in responses by including day-of-week and time-of-day terms. To account

for correlation between measurements that depend on the time of measurement, a time-since-first-response correlation term was modelled. Autocorrelation was also modelled because observations from a participant that were closer in time were more likely to be more similar than observations further apart.

Each stage of the mood management model was analysed separately using the general MLM (adapted for each stage as stated under the corresponding sections below) applied to the data collected in the ESM diaries in order to assess the effect of having BD on the mood management process. A description of the analyses specific to each stage and the related results follows. Note that the reference category for group was control and for current mood was low mood (according to current mood scores-see Section 3.3.2.3.3.1).

3.4.3.2 Stage 1: Detection (mood variability)

To compare variation in mood across groups, separate linear MLMs (general MLM framework) for PA and NA were used to estimate the standard deviation (SD) of the overall residual when it was not allowed to vary between groups and the SD of each group's residual when they were allowed to vary (see Table 21). An Analysis of Variance (ANOVA) was then used to test whether the two models differed significantly. When group residual SDs were allowed to vary the bipolar group showed more variation in both PA and NA than the control group and this difference in variation between groups was particularly evident for NA. Mean level of affect also differed significantly between groups: the control group reported significantly more PA compared to the bipolar group and the bipolar group reported significantly more NA compared to the control group (see Table 23).

Table 21: Allowing for Different Variability in the Control and Bipolar Groups

Affect state	Average score (SD)		Residual SD not allowed to vary	Residual SD allowed to vary		ANOVA p-value
	Control	Bipolar	Overall residual SD	C* residual SD	BD residual SD	
PA	4.51 (1.10)	4.01 (1.44)	0.87	0.78	0.97	<0.001
NA	1.22 (0.57)	1.98 (1.40)	0.70	0.49	0.87	<0.001

*C=control

3.4.3.3 Stage 2: Interpretation

Initially the general linear MLM framework was applied to each dimension of interpretation separately without including current mood in the model (see Table 22). The bipolar group interpreted significantly less personal control, less comprehensibility, a significantly shorter time line (duration of current mood), significantly more concern and more self-dispositional depressive appraisals (IDQ-D) and normalising depressive appraisals (IDQ-N) compared to controls when current mood was not accounted for in analyses.

Table 22: Study 1 Interpretation Results

Dimension	BD mean (SD)	Control mean (SD)	Group B value	Group p- value	95% CI (lower, upper)
Personal Control	5.91 (2.65)	7.21 (1.91)	-1.29	<0.001	-2.04, -0.55
Concern	2.64 (2.14)	1.64 (1.36)	0.97	<0.001	0.46, 1.49
Time Line	5.23 (2.42)	6.32 (1.94)	-0.92	<0.01	-1.60, -0.23
Comprehensibility	6.71 (2.26)	7.92 (1.73)	-1.04	<0.01	-1.72, -0.37
Consequences 1[1]	0.27 (1.74)	0.70 (1.45)	-0.39	0.07	-8.04, 0.03
Consequences 2[2]	1.30 (1.19)	1.08 (1.19)	0.25	0.12	-0.07, 0.57
Cause: HIQ-H	1.89 (0.81)	1.76 (0.75)	0.15	0.28	-0.12, 0.41
Cause: HIQ-N	2.11 (0.92)	2.05 (0.84)	0.07	0.63	-0.22, 0.36
Cause: IDQ-D	1.33 (0.65)	1.03 (0.20)	0.30	<0.001	0.17, 0.43
Cause: IDQ-N	1.55 (0.82)	1.15 (0.44)	0.38	<0.001	0.18, 0.59

[1]Consequences 1: the MLM was performed taking account of the direction of the effect (positive/negative)
[2]Consequences 2: A new variable was calculated that ignored the minus sign so -4 scored the same as +4. The MLM was repeated in order to identify the magnitude of consequences.

3.4.3.3.1 The influence of PA and NA on interpretations

The MLM revealed that there were significant differences between groups in both positive and negative affect (see Table 23). To estimate any effects of positive and negative mood on group differences in interpretations, the general MLM framework was adjusted for

PA and NA simultaneously using two separate parameters for each affect type. Note that overall PA and NA were significantly negatively correlated (r=-0.43, p<0.001) and therefore were unlikely to have cancelled each other out when included simultaneously in the MLM.

Table 23: PA and NA per Group

Mean affect	Control (n=50)	Bipolar (n=42)	Group B value	p-value	95% CI lower	95% CI upper
Mean PA (SD)	4.51 (1.10)	4.01 (1.44)	-0.52	0.01	-0.91	-0.12
Mean NA (SD)	1.22 (0.57)	1.98 (1.40)	0.79	<0.001	0.43	1.15

Table 24 displays the effect of group (columns 1 and 2), the effect of PA (columns 3 and 4) and the effect of NA (columns 5 and 6) on each of the interpretation dimensions (rows 1-7b). The bipolar group still interpreted significantly less personal control, comprehensibility and a shorter time line than the control group. However, the effect of group decreased. Similarly, the bipolar group still made significantly more self-dispositional depressive appraisals (IDQ-D) than controls but group differences decreased.

The effect of group on the direction of consequences became significant and in the opposite direction according to B values (bipolar participants now interpreted significantly *more* positive consequences than controls), the effect of group on self-dispositional hypomanic appraisals (HIQ-H) became significant and bipolar participants also scored significantly higher for normalising hypomanic appraisals (HIQ-N) than controls when PA and NA were included in the MLM. Further, there was no longer a significant effect of group on concern or normalising depressive appraisals (IDQ-N).

The effect of controlling for current mood on interpretations and the utility of doing so will be discussed further in Section 3.5.3.2.

Table 24: The Influence of Mood on Study 1 Interpretation Results

Dimension	1	2	3	4	5	6
	Group β value (95 % CI)	Group p- value	PA B value (95% CI)	PA p-value	NA B value (95% CI)	NA p-value
Personal Control	-0.74 (-1.34, -0.14)	0.02	0.69 (0.64, 0.75)	<0.001	-0.26 (-0.33, -0.19)	<0.001
Concern	1.49 (-0.21, 0.50)	0.42	-0.23 (-0.27, -0.19)	<0.001	0.91 (0.85, 0.97)	<0.001
Time Line	-0.82 (-1.43, -0.21)	0.01	0.61 (0.56, 0.67)	<0.001	0.28 (0.21, 0.36)	<0.001
Comprehensibility	-0.85 (-1.47, -0.22)	<0.01	0.33 (0.28, 0.37)	<0.001	-0.08 (-0.15, -0.02)	0.01
Consequences 1[1]	0.39 (0.08, 0.71)	0.02	0.82 (0.79, 0.86)	<0.001	-0.45 (-0.50, -0.40)	<0.001
Consequences 2[2]	0.11 (-0.20, 0.41)	0.48	0.27 (0.24, 0.31)	<0.001	0.38 (0.33, 0.43)	<0.001
Cause: HIQ-H	0.27 (0.03, 0.51)	0.03	0.19 (0.17, 0.20)	<0.001	-0.06 (-0.08, -0.03)	<0.001
Cause: HIQ-N	0.29 (0.06, 0.52)	0.02	0.27 (0.25, 0.29)	<0.001	-0.12 (-0.14, -0.09)	<0.001
Cause: IDQ-D	0.12 (0.06, 0.24)	0.01	-0.05 (-0.06, -0.04)	<0.001	0.21 (0.19, 0.22)	<0.001
Cause: IDQ-N	0.12 (-0.03, 0.26)	0.11	-0.09 (-0.11, -0.08)	<0.001	0.29 (0.27, 0.31)	<0.001

[1]Consequences 1: the MLM was performed taking account of the direction of the effect (positive/negative)
[2]Consequences 2: A new variable was calculated that ignored the minus sign so -4 scored the same as +4. The MLM was repeated in order to identify the magnitude of consequences.

3.4.3.4 Stage 3: Intention

3.4.3.4.1 Current mood

Rather than using the separate PA and NA variables included in the analysis of the previous stage (interpretation), a single measure of current mood was used in the analysis of intention (see Section 3.3.2.3.3.1 for details regarding the measurement of current mood). Although the MLM revealed that there was no significant difference between groups in current mood (Table 25), the general MLM framework was adjusted for current mood to estimate effects of being in a low, medium or high mood on intention to modify mood.

Table 25: Current Mood Score per Group

Model	Control (n=50)	Bipolar (n=42)	Group B value	p-value	95% CI
Mean (SD)	2.25 (0.50)	2.13 (0.62)	-0.13	0.08	-0.27, 0.02

3.4.3.4.2 Frequency of intention responses depending on current mood and impact on analysis

Tables 26 and 27 show the frequency of intention responses per group depending on the participant's current mood. In both groups, the majority of 'stay the same' and 'go up' responses came from participants in a medium mood. There were too few 'go down' responses to meaningfully analyse 'intention=down' as a single parameter. The 62 total 'intention=down' responses came from only 6 control (average response per participant=2.2, range 1-4) and 12 bipolar (average response per participant=4.1, range=1-16) participants. Therefore 'intention=down' and 'intention=stay the same' were combined (0) and compared to 'intention=up' (1) using multi-level logistic regression. In addition to the fixed effects estimated in the general MLM, effects of current mood and a group-by-current-mood interaction were also estimated.

Table 26: Frequency of Intention Depending on Current Mood for Controls

Current mood	Total				
	Down	Same	Up	Missing	
Low	0	12	58	0	70 (3%)
Medium	11	1012	586	21	1630 (69%)
High	2	596	54	2	654 (28%)
Missing	0	5	2	2	8 (<1%)
Total	13 (1%)	1625 (69%)	700 (30%)	24 (1%)	2362

Table 27: Frequency of Intention Depending on Current Mood for Bipolar

Current mood	Total				
	Down	Same	Up	Missing	
Low	1	8	191	52	252 (14%)
Medium	31	522	490	34	1077 (59%)
High	13	421	46	4	484 (26%)
Missing	4	8	6	4	22 (1%)
Total	49 (3%)	959 (52%)	733 (40%)	94 (5%)	1835

3.4.3.4.3 Results

Results are displayed in Table 28. There were no group differences in intention, however, participants in a medium and high mood were significantly less likely to intend to modify mood up compared to participants in a low mood. Thus, almost all participants with low current mood had intention to make their mood go up.

With regard to high mood, tables 26 and 27 show that when current mood was high the majority of controls (91%) and bipolar (87%) participants intended to keep mood the same rather than lower mood (controls=<1%, BD=3%) or make mood go higher (controls=8%, BD=10%).

*Table 28: The Effects of Group, Mood and Group*Mood Interaction on Intention to Go Up*

Model	Odds ratio	p-value value	Odds ratio 95% CI lower	Odds ratio 95% CI upper
Effect of group on intention=up	2.33	0.16	0.71	7.66
Effect of current mood on intention=up	Med=0.04 High=0.004	<0.001 <0.001	0.02 0.001	0.10 0.009
Effect of group*current mood on intention=up	Med=0.72 High=0.64	0.55 0.45	0.25 0.19	2.10 2.13

3.4.3.5 Stages 4a and 4b: Selection and Implementation

3.4.3.5.1 Frequency of selection and implementation responses and impact on analysis

Tables 29 and 30 highlight that, for both groups, there were large differences between the frequency of total responses (total resp's) for the selection and implementation of coping strategies (CS) compared to the number of participants ever selecting or implementing that coping strategy (No. ppts resp'd). Thus, indicating that participants were selecting/implementing CS multiple times and therefore one participant could always be using the same CS. For this reason analysis should account for repeated observations. Indeed, for the CS displayed in Tables 31 and 32, a MLM was applied to the data which accounted for multiple responses per participant (see Section 3.4.3.5.2). However for CS displayed in Tables 34 and 35 there was not enough variability in the outcome measure to

reliably estimate parameters using a MLM and therefore logistic regression without the repeated measures structure was applied (see Section 3.4.3.5.3). For the CS displayed in Tables 36 and 37 response rates were too low to perform meaningful analyses and so descriptive statistics were reported (see Section 3.4.3.5.4). Due to large amounts of missing data, patterns of missing data were explored for the selection and implementation of CS according to intention and current mood and results can be seen in Appendix 9. The implications of these methods of analysis will be discussed.

Table 29: Frequency of CS Selection per Group

	Control			Bipolar		
Coping strategy	No. ppts resp'd	Av resp. per ppt	Total resp's (%of C total resp's	No. ppts resp'd	Av resp. per ppt	Total resp's (% of BD total resp's)
Eligible beeps (4197)			2362 (56.28)			1835 (43.72)
1. No activity given*	37	10.76	398 (16.85)	22	6.82	150 (8.17)
2. Therapy	3	1.00	3 (0.13)	9	3.22	29 (1.58)
3. Religious activity	1	1.00	1 (0.04)	5	4.20	21 (1.14)
4. Cigarettes/alcohol	11	2.00	22 (0.93)	4	1.50	6 (0.33)
5. Home/less contact	28	2.25	63 (2.67)	20	2.40	48 (2.62)
6. Cog/beh	34	2.59	88 (3.73)	22	3.68	81 (4.41)
7. Medication	3	1.33	4 (0.17)	9	4.89	44 (2.40)
8. Leave or finish work	23	1.48	34 (1.44)	3	1.33	4 (0.22)
9. Breaks/relax	45	5.11	230 (9.74)	32	8.03	257 (14.01)
10. Sleep	43	3.44	148 (6.27)	31	4.48	139 (7.57)
11. Daily activities	47	17.32	814 (34.46)	38	17.63	670 (36.51)
12. Social interaction	52	3.21	167 (7.07)	33	4.36	144 (7.85)
13. Productive/plans	36	4.36	157 (6.65)	27	4.59	124 (6.76)
14. Change	11	1.45	16 (0.68)	8	1.00	8 (0.44)
15. Exercise/activity	27	4.59	124 (5.25)	21	6.71	141 (7.68)
16. Enjoyable activity	28	3.29	92 (3.90)	11	2.55	28 (1.53)
27. Nature	11	2.82	31 (1.31)	10	1.20	12 (0.65)
18. Cannot code	3	1.00	3 (0.13)	4	9.00	36 (1.96)
Missing			204 (8.64)			169 (9.21)

*Includes responses 'nothing/don't know', 'don't need to/unable to do anything' and 'keep doing what I'm doing/stay the same'.

Table 30: Frequency of CS Implementation per Group

	Control			Bipolar		
Coping strategy	No. ppts resp'd	Av resp. per ppt	Total resp's (%of C total resp's	No. ppts resp'd	Av resp. per ppt	Total resp's (% of BD total resp's)
Eligible beeps (4197)			2362 (56.27)			1835 (43.72)
1. No activity given*	48	24.88	1194 (50.55)	37	15.84	586 (31.93)
2. Therapy	2**	1.00	2 (0.08)	9	2.56	23 (1.25)
3. Religious activity	1	1.00	1 (0.04)	6	2.83	17 (0.93)
4. Cigarettes/alcohol	14	2.00	28 (1.19)	4	1.00	4 (0.22)
5. Home/less contact	11	1.64	18 (0.76)	12	1.42	17 (0.93)
6. Cog/beh	15	1.73	26 (1.10)	16	3.00	48 (2.62)
7. Medication	2	1.00	2 (0.08)	14	3.29	46 (2.51)
8. Leave or finish work	14	1.43	20 (0.85)	2	2.00	4 (0.22)
9. Breaks/relax	18	2.44	44 (1.86)	26	5.00	130 (7.08)
10. Sleep	29	2.24	65 (2.75)	31	3.10	96 (5.23)
11. Daily activities	45	9.18	413 (17.49)	39	14.44	563 (30.68)
12. Social interaction	29	3.07	89 (3.77)	33	4.09	135 (7.36)
13. Productive/plans	24	2.67	64 (2.71)	23	2.74	63 (3.43)
14. Change	3	1.00	3 (0.13)	1	1.00	1 (0.05)
15. Exercise/activity	30	3.13	94 (3.98)	25	3.72	93 (5.07)
16. Enjoyable activity	4	1.00	4 (0.17)	5	1.40	7 (0.38)
27. Nature	8	2.88	23 (0.97)	7	2.00	14 (0.76)
18. Cannot code	0	0.00	0 (0.00)	3	1.67	5 (0.27)
Missing			367 (15.54)			184 (10.03)

*Includes responses 'nothing/don't know', 'don't need to/unable to do anything' and 'keep doing what I'm doing/stay the same'.
** One control participant reported a reflexology session and another reported meditation as a therapy.

3.4.3.5.2 MLM analyses

3.4.3.5.2.1 Overview of analysis and results

Each response for the CS in tables 31 and 32 was dummy coded (1=CS used, 0=CS not used/missing) to account for multiple responses to more than one CS at one alert. Data were analysed using multi-level logistic regression to account for the repeated measure structure of the data. In addition to the fixed effects estimated in the general MLM, the effects of intention=up and current mood were estimated. Additionally, to assess strategy implementation, participants were asked to report what they had done to modify mood

since the last alert and therefore implementation (at time 2; T2) was examined depending on the participant's intention and current mood at the previous time point (time 1; T1).

Control participants were significantly more likely to *select* enjoyable activities and bipolar participants were 4 times more likely to *implement* CS related to taking a break/relaxing and twice as likely to *implement* CS related to daily activities or social interaction compared to controls.

Table 31: Selection CS Analysed Using MLM

Coping strategy	Group odds ratio	Group p-value	Odds ratio 95% CI lower	Odds ratio 95% CI upper
Cognitive/behavioural	0.92	0.76	0.53	1.59
Breaks/relax	1.36	0.22	0.83	2.24
Sleep	1.64	0.54	0.71	1.91
Daily activity	1.13	0.65	0.67	1.90
Social interaction	1.19	0.47	0.74	1.92
Enjoyable activity	0.31	<0.01	0.14	0.70

Table 32: Implementation CS Analysed Using MLM

Coping strategy	Group odds ratio	Group p-value	Odds ratio 95% CI lower	Odds ratio 95% CI upper
Breaks/relax*	4.06	<0.001	1.93	8.53
Daily activities	2.28	<0.01	1.38	3.78
Social interaction*	2.13	<0.01	1.27	3.56

*No autocorrelation included in the MLM because there was a negligible correlation between observations from the same participant that are closer in time. Further, excluding the autocorrelation term from the general MLM had a negligible effect on the odds ratios, p-values and CIs for breaks and social CS.

3.4.3.5.2.2 The impact of current mood and intention

Table 33 presents data regarding the impact of current mood and intention (at T1) on selection (at T1) and implementation (at T2) of CS analysed using a MLM.

- *Medium versus low mood:* Participants in a medium mood were significantly less likely (odd ratio=0.60) to *select* cognitive/behavioural CS, and just under 1.5 times more likely to *select* daily activities, compared to participants in a low mood.
- *High versus low mood:* Participants in a high mood were twice as likely to *select* social interaction and over 6 times more likely to select enjoyable activities at T1, but

significantly less likely to *implement* social interaction at T2 (odds ration=0.50), compared to participants in a low mood.

- *Intention to go up versus stay the same/go down:* Participants with the intention to go up were significantly less likely to *select* taking a break/relaxing (odd ratio=0.53), but over 1.5 times more likely to *select* cognitive/behavioural, almost twice as likely to *select* sleep and just over 1.5 times more likely to *select* social interaction CS, compared to participants with the intention to stay the same/go down. However, participants with the intention to go up were just under 1.5 times more likely to *implement* daily activities compared to participants with the intention to stay the same/go down.

Table 33: Covariates in the Selection and Implementation of CS

		Current mood at T1= Medium		Current mood at T1=high		Intention at T1	
	CS	*Odds ratio (CI)*	*p value*	*Odds ratio (CI)*	*p value*	*Odds ratio (CI)*	*p value*
Select T1	Cog/beh	0.60 (0.40, 0.92)	0.02	0.65 (0.38, 1.10)	0.11	1.70 (1.28, 2.24)	<0.001
	Break/relax	0.73 (0.47, 1.14)	0.17	0.64 (0.38, 1.07)	0.09	0.53 (0.41, 0.70)	<0.001
	Sleep	1.04 (0.63, 1.73)	0.87	0.77 (0.42, 1.40)	0.38	1.94 (1.44, 2.62)	<0.001
	Daily act.	1.43 (1.03, 2.00)	0.03	1.28 (0.87, 1.88)	0.22	1.11 (0.94, 1.32)	0.23
	Social	1.38 (0.81, 2.35)	0.24	2.02 (1.10, 3.71)	0.02	1.62 (1.24, 2.12)	<0.001
	Enjoyable	3.32 (0.82, 13.20)	0.09	6.65 (1.61, 27.52)	0.01	1.09 (0.76, 1.58)	0.64
Imp T2	Break/relax	1.63 (0.91, 2.93)	0.10	1.21 (0.59, 2.46)	0.61	0.72 (0.52, 1.03)	0.07
	Daily act.	1.23 (0.88, 1.72)	0.23	1.20 (0.80, 1.79)	0.38	1.42 (1.18, 1.72)	<0.001
	Social	0.63 (0.39, 1.02)	0.06	0.50 (0.28, 0.89)	0.02	1.22 (0.90, 1.66)	0.21

3.4.3.5.3 Logistic regression without repeated measures structure

3.4.3.5.3.1 Overview of analysis and results

For the CS in Tables 34 and 35 there was not enough variability in the outcome measures to be able to estimate the parameters reliably using a repeated measures structure. Therefore, each participant was given a frequency count for the total number of times the CS could have been used (eligible responses out of 70) and the actual number of times it was used (including multiple responses). Each CS was then analysed separately using logistic regression without the multi-level structure. Intention and current mood were not included in these models because these variables must be aggregated across the study period in order to be included in single-level analysis (see Appendix 10 for details of CS selection and implementation according to intention and current mood).

Bipolar participants were twice as likely to *select* exercise CS and to *implement* cognitive/behavioural and sleep (but not exercise CS) compared to controls. Thus, what people say they will do to manage mood (selection) is not necessarily what they actually do (implementation).

Table 34: Selection CS Analysed Using Logistic Regression

Selection code	Group odds ratio	Group P value	Odds ratio 95% CI lower	Odds ratio 95% CI upper
Home/less contact	0.98	0.92	0.67	1.43
Productivity/planning	1.02	0.88	0.80	1.30
Exercise	1.50	<0.01	1.71	1.93

Table 35: Implementation CS Analysed Using Logistic Regression

Implementation code	Group odds ratio	Group P value	Odds ratio 95% CI lower	Odds ratio 95% CI upper
Cognitive/behavioural	2.14	<0.001	1.51	3.96
Sleep	1.95	<0.001	1.42	2.70
Productivity/planning	1.28	0.18	0.90	1.82
Exercise	1.29	0.09	0.96	1.73

3.4.3.5.4 Selection and implementation descriptive statistics

For the remaining eight CS listed in Tables 36 and 37 there were few participants reporting their use, and for some, a large number of responses came from the same

participant. For example, for selection of therapy by bipolar participants 16 of the 29 responses came from a single participant and for implementation of religious activity by bipolar participants 11 of the 18 responses came from a single participant. For these reasons these variables were not formally analysed.

Table 36: Frequency of Selection CS with Too Few Responses for Analysis

Coping strategy	Total responses		
	Control	*Bipolar*	*Total*
Therapy	3	29	32
Religious activity	1	21	22
Cigarettes/alcohol	22	6	28
Medication	4	44	48
Leave or finish work	34	4	38
Change	16	8	24
Nature	31	12	43

Table 37: Frequency of Implementation CS with Too Few Responses for Analysis

Coping strategy	Total responses		
	Control	*Bipolar*	*Total*
Therapy	2	23	25
Religious activity	1	17	18
Cigarettes/alcohol	28	4	32
Medication	2	46	48
Home/less contact	18	17	35
Leave or finish work	20	4	24
Change	3	1	4
Enjoyable activity	4	7	11
Nature	23	14	37

3.4.3.5.5 Group differences in the implementation of selected CS

A new variable (selection plus implementation) was created corresponding to whether the coping strategy selected at T1 was implemented by the next response (T2), where 1= implementation code at T2 matches selection code at T1, 0=no match/missing. Note that the average time gap for eligible responses (ignoring the overnight time gap between 10:15pm and 7:45am) was 1 hour 55 minutes for control and 1 hour 56 minutes for bipolar participants.

Only the daily activities CS had enough variability in the data to perform MLM analysis. For the daily activities CS, selection plus implementation was analysed using multi-level logistic regression based on the general MLM framework (see Table 38). There were no significant effects of group on selection plus implementation of daily activities.

Table 38: Group Differences in Implementing Selected Daily Activities CS

Implementation code	Group odds ratio	Group P value	Odds ratio 95% CI lower	Odds ratio 95% CI upper
Daily activities	1.71	0.10	0.90	3.25

Frequency counts for the other CS were too low to perform meaningful analysis. Table 39 displays descriptive statistics regarding the frequency of selection, implementation and selection plus implementation for each coping strategy per group. Although controls selected and implemented more CS than bipolar participants, as a proportion of eligible responses the bipolar group selected and implement more CS than the control group. However, controls reported that they did not need to do anything (selection) to modify their mood twice as much as bipolar participants and that they had not done anything (implementation) to modify their mood almost twice as much bipolar participants. At T2, bipolar participants implemented 14% more CS that were selected at T1 compared to controls. Thus, it appeared that control participants were less actively trying to manage mood, or less aware of mood management, compared to bipolar participants.

Table 39: Frequency of CS Selected and Implemented with Too Few Responses for Analysis

Coping strategy	Control			Bipolar		
	Select	Implement	Select+Imp	Select	Implement	Select+Imp
Therapy	3	2	0	29	23	12
Religion	1	1	1	21	17	6
Cig/alc	22	28	10	6	4	1
Home/less contact	63	18	7	48	17	8
Cog/beh	88	26	4	81	48	11
Medication	4	2	0	44	46	20
Work	34	20	5	4	4	0
Breaks/relax	230	44	23	257	130	68
Sleep	148	65	20	139	96	39
Daily act.	814	413	259	670	563	327
Social interaction	167	89	34	144	135	41
Productive/plan	157	64	24	124	63	10
Change	16	3	1	8	1	0
Exercise	124	94	37	141	93	47
Enjoy	92	4	2	28	7	3
Nature	31	23	5	12	14	3
Total (% of eligible responses)	*1994 (51%)*	*896 (38%)*	*432(18%)*	*1756 (96%)*	*1261(69%)*	*596 (32%)*
Nothing/don't need to (% of eligible responses)	398 (17%)	1194 (51%)	-	150 (8%)	586 (32%)	-

3.4.3.6 Stage 5a: Evaluation

3.4.3.6.1 Overview of analysis and results

The total number of participants evaluating their mood as 'down' at (time 2; T2) was too small to meaningfully analyse 'evaluation T2=down' as a single parameter. The total 124 evaluation=down responses came from 14 control (average response per participant=2.4, range 1-8) and 26 bipolar (average responses per participant=3.3, range 1-13) participants. Therefore, a new variable was created (EvalUpT2), where 'evaluation T2=down' and 'evaluation T2=stay the same' were combined (0) and compared to 'evaluation T2=up' (1) using multi-level logistic regression. It was not possible to fit a MLM due to low counts. Thus, EvalUpT2 was modelled using the general model framework including intention=up and a group-by-intention=up interaction but without a time-since-first-response correlation term and autocorrelation. This improved the estimation of random effects. Current mood at T2 was not included in the model because it was likely to be associated with evaluation at T2

(i.e. if evaluation was 'up' then current mood was likely to be 'higher' on average than if evaluation was 'down'), and would therefore adjust out any potential differences.

Results are displayed in Table 40. There was no significant effect of group on evaluation of current mood. Both groups were significantly more likely to evaluate their mood as 'gone up' if their intention was to make their mood go up.

*Table 40: The Effects of Group, Intention and Group*Intention Interaction on Evaluation=Up at T2 (EvalUpT2)*

Model	Odds ratio	P value	Odds ratio 95% CI lower	Odds ratio 95% CI upper
Effect of group on EvalUpT2	0.69	0.21	0.38	1.24
Effect of Intention = Up on EvalUpT2	2.08	<0.001	1.54	2.82
Effect of Group * Intention = Up on EvalUpT2	0.69	0.07	0.46	1.03

3.4.3.6.2 Evaluation depending on intention

Table 41 shows the frequency of reappraisal responses (at T2) per group depending on what the participant's intention was at the previous time point (T1). Twenty six percent of control and 37% of bipolar participants' responses were to 'stay the same' when intention was to stay the same. Forty percent of control and 38% of bipolar participants' responses evaluated mood as 'up' when intention was to go up. Eight percent of control and 10% of bipolar participants' responses evaluated mood as down when they intended to go down.

Note that there was a large amount of missing data (43%) at evaluation T2, regardless of intention. Counts were especially low for evaluation T2=down but this was likely to be due to few participants intending to make their mood go down at T1. Although the majority of missing evaluation data occurred for intention=stay the same (68%), this was not very different from the total 'intention=stay the same' responses (62%). Thus, there were only 6% more 'stay the same' responses from the sample who missed the evaluation item compared to the sample who responded to the intention item. It is also worth noting that 68% of the missing data came from control participants.

Table 41: Frequency of Evaluation at T2 Depending on Intention at T1

Intention at time 1	Group	Evaluation at time 2				
		Down	Same	Up	Missing	Total
Down	Control	1	3	3	6	13
	Bipolar	5	15	19	10	49
	Total	6	18	22	16	62
Stay same	Control	19	419	283	904	1625
	Bipolar	38	354	261	306	959
	Total	57	773	544	1210	2584
Up	Control	16	114	279	291	700
	Bipolar	38	211	282	202	733
	Total	54	325	561	493	1433
Missing	Control	1	3	3	17	24
	Bipolar	6	23	12	53	94
	Total	7	26	15	71	119
Total	Control	37	539	568	1219	2362
	Bipolar	87	603	574	571	1835
	Total	124	1142	1142	1790	4197

3.4.3.7 Stage 5b: Repetition

Successful mood management cycles were defined as those in which intention=up (at T1) matched evaluation=up at the subsequent time point (T2). Where a participant had achieved a successful mood management cycle, the CS used between time 1 and 2 were identified as successful CS.

3.4.3.7.1 Repetition descriptive statistics

Table 42 presents descriptive data regarding the frequencies of successful CS used per participant (No. ppts) and per group (Total resp's), and the average number of repetitions per participant (Av. resp per ppt). The most commonly used successful CS for both groups were daily activities, social activities and exercise and due to reasonable frequencies of use, only these CS were analysed further.

Table 42: Successful CS Descriptives

Successful CS	Control			BD		
	No. ppts	Av. resp per ppt	Total resp's	No. ppts	Av. resp pre ppt	Total resp's
Therapy	0	0.00	0	5	1.60	8
Religion	1	1.00	1	5	2.80	14*
Cigarettes/Alcohol	7	1.14	8	2	1.00	2
Go home	7	1.43	10	7	1.14	8
Cognitive/Behavioural	10	1.40	14	6	1.50	9
Medication	0	0.00	0	1	4.00	4
Finish work	8	1.25	10	1	1.00	1
Breaks	8	1.75	14	10	1.70	17
Sleep	8	1.13	9	16	1.31	21
Daily activities	**35**	**3.71**	**130**	**33**	**4.27**	**141**
Social	**17**	**2.18**	**37**	**18**	**2.39**	**43**
Productive/Planning	14	1.21	17	12	1.33	16
Change	3	1.00	3	1	1.00	1
Exercise	**20**	**2.1**	**42**	**16**	**2.50**	**40**
Enjoyable activity	1	1.00	1	3	1.00	3
Nature	5	1.40	7	3	1.33	4
Total successful CS			*303*			*332*
Total CS			*896*			*1261*
Successful cycles			*279*			*282*
Intention=Up			*700*			*733*

*10 responses came from a single participant

3.4.3.7.2 Overview of analysis and results

Table 42 also highlights that for both groups, there were large differences between the frequency of total responses (Total resp's) compared to the number of participants ever successfully using that CS (No. ppts). Thus, indicating that participants were using CS multiple times and therefore one participant could always be using the same CS successfully. For this reason, analyses should account for repeated observations. However, there was not enough variability in successful CS to analyse the data using MLM. Therefore each participant was given a frequency count for the total number of times any CS was used and total number of times each particular CS was successfully used (including multiple responses). Each CS was then analysed separately using logistic regression without the repeated measures structure to identify which CS were most often being used successfully as a proportion of the CS ever used in each group (see Table 43). Issues regarding this analysis will be discussed.

Although the average responses per participant (Table 34) for daily activities and exercise were higher in the bipolar group, suggesting that this group used these CS successfully more often than controls, Table 43 indicates that higher frequencies were obtained because the bipolar group reported using more of these CS overall (see Table 31). According to the results in Table 43, the control group used a higher proportion of daily activities and exercise CS successfully compared to the bipolar group. This perhaps indicates that controls are more likely to repeat successful cycles of mood management. However, the repetition stage of mood management could not be fully examined because most participants used several different CS successfully over the study week and only a small proportion favoured the same CS (see Table 44). Only 22% (*n*=11) of control and 33% (*n*=14) of BD participants used the same CS successfully more than 5 times over the study week and the majority of repeated successful CS came from the daily activities category (91% of control and 79% of bipolar successful CS used ≥5 times). Therefore, future research is needed to examine whether there is a difference between people with and without BD in the rate of repetition of successful mood management cycles.

Table 43: Proportion of Successful CS Use out of All CS Used

CS	Group odds ratio	P value	Odds ratio 95% CI lower	Odds ratio 95% CI upper
Daily activities	0.74	0.02	0.57	0.96
Social	0.80	0.33	0.51	1.26
Exercise	0.65	0.05	0.42	1.01

Table 44: Most Commonly Used CS

Most common CS used	Control		Bipolar	
>1 time per ppt, per wk	No. ppts	No. times	No. ppts	No. times
Religion			1	10
Go home	1	2		
Cognitive/Behavioural	2	6		
Medication			1	4
Breaks	1	4		
Sleep	3	14	1	4
Daily activities	21	106	21	109
Social			5	26
Product/planning	2	4	1	2
Exercise	6	20	4	16
Nature	1	2	1	2

3.5 Discussion

3.5.1 Summary of main findings

ESM was used to examine mood management within the framework proposed during a typical week of daily life. At the detection stage, people with BD experienced significantly more variability in both PA, and particularly, NA compared to controls outside of episode, during a normal week of daily life. Following the detection of a mood change, people with BD interpreted more positive consequences, less personal control, less comprehensibility, a shorter duration of mood and used more self-dispositional appraisal styles than controls when current mood was controlled for in analyses. Contrary to predictions, there were no statistically significant group differences in intention to modify mood. A distinction was made between coping strategy selection and implementation and it emerged that the strategies selected to manage mood were not always the ones that were implemented. Further, people with BD appeared to be actively trying to manage mood, or were more aware of managing mood, compared to controls. No significant group differences were found at the evaluation or repetition stages.

3.5.2 The ESM procedure

The ESM procedure was successful (30% of alerts responded to within 10 minutes) for 100% (n=50) of the control and 84% (n=42) of the BD sample. Data from these participants only were used in analyses (eligible sample n=92). It is interesting to note that the eligible control sample responded to more of all possible alerts (n=2362 compared to n=1835 out of 7000). Alerts were unlikely to have been missed due to changes in mood which would have biased results. The most common reasons for missed alerts for both control and bipolar groups were sleep, socialising, work and equipment problems. However, it should be noted that sleeping could have been a consequence of mood.

Akin to the current findings, previous ESM studies with bipolar samples have reported lower compliance in bipolar compared to control groups (Havermans et al., 2007; Myin-Germeys et al., 2003). Compliance with the ESM procedure in the bipolar sample was not related to clinical characteristics. However, there was a significant difference between the eligible (n=42) and ineligible (n=8) groups in living arrangements, with nearly half the eligible sample living with a partner compared to only a quarter of the ineligible sample. Interestingly, significantly more of the eligible controls (n=50) also lived with a partner compared to the eligible bipolar (n=42) sample. Therefore, there may be an impact of social support on ability or motivation to comply with ESM. Perhaps significant others help to motivate participants involved in ESM studies or provide additional reminders, or maybe people with partners are more compliant for reasons such as social conformity. On the other hand, ineligible and control participants may just have had more partners and therefore this seemed to be a difference related to compliance when perhaps it was not. The association between living arrangements and compliance with ESM requires further testing.

Due to the nature of ESM it is generally recognised that there is a potential for burden, disruption and reactivity (Palmier-Claus et al., 2011). However, in the current study both groups (control and bipolar) perceived the study week as moderately ordinary and reported that the study had little influence on their mood. There was a small but significant difference between groups in these ratings, with controls rating the week as slightly more ordinary and the study as having slightly less influence on mood. Most psychological research (including previous ESM studies) does not report the influence of the study procedure on participants and therefore results should be interpreted with caution. Real-world research should be aware of how participants react to the procedures used and interpret results accordingly.

3.5.3 The stages of mood management

Differences in how people with and without BD manage mood in everyday life was examined using the mood management model framework proposed in the current research (Figure 11). Significant differences were found between people with and without BD in mood variability (stage 1), how mood was interpreted (stage 2) and the strategies selected and implemented to manage mood (stages 4a & 4b). Findings are discussed below in relation to the stages of mood management examined.

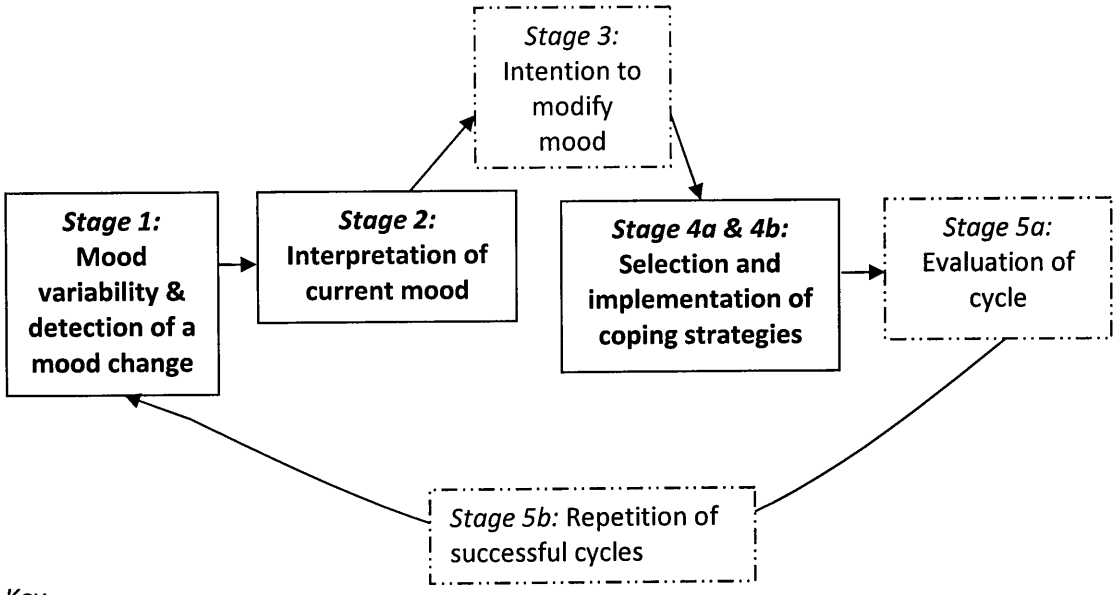


Figure 11: Group differences in mood management (ESM)

3.5.3.1 Stage 1: Detection (Mood variability)

In line with predictions, people with BD experienced significantly more variability in both PA, and particularly, NA compared to controls. Previous research using ESM has reported increased variability in mood in remitted BD participants based on standard deviations of PA and NA (Knowles et al., 2007). However, this research only measured mood twice a day during the study week and therefore may not have been able to capture, in full, the variability in mood across a week. In the current study, results were replicated using a more intense sampling procedure involving 10 assessments per day for 1 week. Using the

same sampling procedure (10 times daily for 1 week), Pavlickova et al. (2013) reported that more pronounced fluctuations in mood were associated with symptoms of depression and mania. Akin to previous ESM research (Havermans et al., 2010), the BD sample in the current study had significantly lower mean PA and significantly higher mean NA and so increased variability in BD could have been due to increased NA. However, although significant, the mean difference in NA was small (0.50 of a score as measured on a 1-7 scale) and therefore is unlikely to have impacted largely on mood fluctuations. Further, people with BD experience subsyndromal symptoms in between episodes (Judd et al., 2002), therefore controlling for mood symptoms when assessing mood variability may, in part, control for having BD. Whether current mood should be controlled for in the study of BD is debatable and indeed the results from the following stage (interpretation) highlight the impact controlling for current mood has on outcome measures.

3.5.3.2 Stage 2: Interpretation

In line with current predictions, people with BD interpreted significantly more positive consequences related to current mood, less personal control over current mood, less comprehensibility regarding current mood, a shorter duration of current mood and significantly more self-dispositional appraisals (hypomanic and depressive) regarding the cause of current mood than control participants when current mood was controlled for in analyses. It should be noted at the outset that including PA and NA in the analyses had an effect on group differences for all of the dimensions of interpretation tested, but especially for interpretations related to positive aspects (i.e. interpretations of positive consequences, less concern and self-dispositional hypomanic appraisals) which were possibly masked by increased NA in BD. Without taking current mood into account, the results regarding differences between people with and without BD in interpretations of current mood would have been different. These results highlight the impact taking current mood into account has

on the examination of cognitive processes in BD and indicates a potential avenue for future research. The utility of controlling for current mood when studying BD is discussed further in Section 3.5.4. Each dimension along which people interpret their mood related experiences will now be discussed in turn.

3.5.3.2.1 Consequences

A limitation of the BIPQ is that it does not distinguish between positive and negative consequences despite emerging literature regarding positives in BD (Galvez et al., 2010; Lobban et al., 2012; Seal et al., 2008). The current study assessed interpretations of both the positive and negative consequences related to current mood. As would be expected, PA was associated with interpretations of significantly more positive consequences and NA with interpretations of significantly less positive consequences in both groups. Without controlling for current mood people with BD did not perceive more positive or negative consequences associated with mood compared to controls. This seems surprising given that, by definition, people with BD have experienced past episodes of depression and hypo(mania) which are associated with negative and positive consequences. Interestingly, when current mood was controlled for, people with BD interpreted significantly *more* positive consequences than controls.

Bipolar participants reported more NA on average and because higher NA was associated with interpretation of less positive consequences, without adjusting for NA, bipolar participants appeared to interpret less positive consequences. These results have important implications for future research into the positive aspects of BD. Without considering current mood state, people with BD may not report positive aspects of the disorder due to low current mood. Therefore, positive in BD will be under-reported, resulting in a negatively biased picture of BD without affording proper attention to the positive aspects of hypomanic experiences (Seal et al., 2008) and positive psychological traits (Galvez

et al., 2010; Lobban et al., 2012) associated with BD. It should be noted that, despite the bipolar group reporting more positive consequences than controls, there were no group differences in the magnitude of consequences reported. This may be due to studying interpretations in daily life where neither group were expected to (or reported) experiencing significant changes in mood. Minor mood fluctuations experienced as part of normal life may not trigger interpretations regarding the magnitude of consequences large enough for detection in the current study. Future research could use a larger sample to increase power to detect small effects in the magnitude of consequences or attempt to induce larger changes in mood sufficient to activate interpretations regarding the magnitude of consequences.

3.5.3.2.2 Personal control

In line with predictions and previous research (Lobban et al., 2013), people with BD interpreted significantly less personal control over mood than controls regardless of whether current mood was controlled for. Previous research (Crowe et al., 2012) and a number of theories view control as integral to the understanding of psychopathology (e.g. PCT; Powers, 1973) and specifically BD (ICM; Mansell et al., 2007). Given that people with BD experience extreme changes in mood that they are unable to curtail by their own efforts, it seems unsurprising that they perceived a lack of personal control over their emotions.

3.5.3.2.3 Concern

In line with previous findings (Lobban et al., 2013), without controlling for current mood there were increased perceptions of concern about mood in BD compared to controls. However, when current mood was controlled this difference disappeared. Bipolar participants felt more NA on average and higher NA was associated with interpretation of more concern. Therefore, without adjusting for NA, bipolar participants appear to interpret

more concern due to feeling more NA, thus highlighting the potential implications of considering current mood state. Without considering current mood we may over-emphasise the negative aspects of BD.

People with BD interpreted less personal control and by definition experience extreme mood changes, yet were not concerned which seems surprising. Perhaps a certain level of concern is actually adaptive and inhibits complacency regarding mood swings. Additionally, concern may be associated with interpretations of consequences and given that people with BD did not interpret a higher magnitude of consequences and reported significantly more positive consequences than controls perhaps this result is not so surprising.

3.5.3.2.4 Comprehensibility

In line with predictions and studies of illness comprehension in other mental health disorders (e.g. Godoy-Izquierdo et al., 2007; Higbed & Fox, 2010), people with BD found their moods significantly more difficult to understand than controls regardless of whether current mood was controlled for. These findings suggest that people with BD lack a coherent model regarding mood and mood fluctuations despite the development of formulations often being a significant part of clinical intervention.

3.5.3.2.5 Time line

By definition, people with BD have experienced prolonged periods of extreme mood changes, therefore it was predicted that people with BD would interpret a significantly longer duration of mood than controls, based on these experiences. This prediction was not supported by the current results (people with BD interpreted a significantly shorter time line than the control group regardless of whether current mood was controlled for). Control participants may have interpreted a longer time line because the study took place during a

typical week in which both groups experienced only minor changes in mood. Therefore, if current mood remained within normal range for the study week, controls were interpreting a longer duration of normal mood and people with BD were reporting that normal mood would continue for a shorter duration. Given that people with BD experienced significantly more variability in mood during the same week this result is not surprising.

3.5.3.2.6 Cause

In line with previous findings (Jones et al., 2006a; Jones & Day, 2008) participants with BD also reported significantly more self-dispositional hypomanic and depressive appraisals than controls, suggesting that they attribute the cause of both positive and negative mood to internal characteristics. Such appraisals are likely to increases symptoms of hypomania and depression and may increase risk of relapse for people with BD. Interestingly, group differences in self-dispositional hypomanic appraisals were only revealed when current mood was controlled for in analysis. Controls had higher average PA than bipolar participants and higher PA was associated with interpretation of self-dispositional hypomanic appraisals. Therefore, the reason why no group differences were initially revealed regarding self-dispositional hypomanic appraisals could be attributed to controls feeling more PA.

Contrary to predictions, people with BD interpreted significantly more normalising hypomanic appraisals than controls (as well as more hypomanic appraisals). Hypomanic appraisals attribute the cause of mood to internal characteristics, while normalising hypomanic appraisals attribute cause to external factors. Thus, these dimensions are in direct contrast to each other. One reason for this finding could be that people with BD score higher on all measures. However, this is an unlikely explanation because the bipolar group did not score higher for normalising *depressive* appraisals. A more likely reason is due to a methodological limitation regarding the question about normalising hypomanic appraisals. It

is not entirely clear that this question relates only to external attributions, for example 'things happen to being going well for me at present' could be extended by thoughts such as '...because I am a brilliant person'. The question is not explicit about *why* things are going well and could be made to more clearly represent external attributions e.g. 'things happen to be going well for me present because of my current situation'.

3.5.3.3 Stage 3: Intention

Although there were no group differences in intention to modify mood, intention did appear to be influenced by current mood in both groups. In line with predictions, few participants intended to make mood go down and therefore only intention to go up was statistically analysed. Although double the number of participants with BD (n=12) compared to controls (n=6) had the intention to go down this intention came from people in a medium or high mood in both groups. Interestingly, one participant with BD intended to go down when in a low mood. On experiencing negative affect an intention to further decrease mood could explain why people with BD suffer periods of depression. Investigation of intention to decrease mood when low should be conducted with a larger sample.

In both groups, participants were significantly more likely to intend to make mood go up if current mood was low compared to when current mood was medium or high and patterns of intention revealed that people with BD were not 'chasing the highs' any more than control participants. When current mood was high the majority of controls (91%) and bipolar (87%) participants intended to keep mood the same rather than lower mood (controls=<1%, BD=3%) or make mood go higher (controls=8%, BD=10%). These finding are contrary to the prediction that bipolar participants would be more likely to intend to modify mood up when current mood was high due to striving for, and enjoying, a state of mild hypomania (Lam et al., 2004; Lam et al., 2005; Lee et al., 2010; Wright et al., 2005). However, only 28% of control and 26% of bipolar participants reported being in a high mood and so

intentions to modify mood when high may have been constrained due to low numbers of participants in this mood state. Further research with larger samples is needed to understand intentions to modify mood in BD when current mood is high.

3.5.3.4 Stage 4a & 4b: Selection and implementation

Due to low response rates (total responses <74) for several coping strategy categories only the cognitive/behavioural, breaks/relax, sleep, daily activities, social interaction, productivity/planning and exercise categories were analysed for *both* the selection and implementation stages (additionally enjoyable activities and home/less contact were analysed for selection only). Although the bipolar group *selected* significantly more exercise CS (and significantly less enjoyable activities), there were no group differences in the *implementation* of exercise CS. Rather, the BD group implemented significantly more of all of the other types of CS analysed compared to controls (other than those related to productivity/planning). This result indicates that healthy controls may be less self aware of explicitly doing things to manage mood or perhaps do not frame responses as CS because they are not really having to cope with anything (i.e. not experiencing mood changes that indicate a mood episode and require management). In line with this suggestion, control participants reported that they did not need to do anything (selection), and that they had not done anything (implementation), to modify their mood twice as much as bipolar participants. Further, the BD group reported selecting and implementing more CS overall and the BD group implemented more CS that were selected at the previous time point (as a proportion of eligible responses) compared to the control group. Perhaps people with BD become more aware as a result of past experiences and treatment focussing on mood management in which they are explicitly taught to monitor for early warning signs of relapse and employ adaptive coping strategies (e.g. Colom & Vieta, 2006; Colom et al., 2009). Fifty

two percent of the BD group were having current, or had received past, treatment for mood, while none of the control group had, or were having, treatment for mood.

Current mood had an impact on the CS selected and implemented. The cognitive/behavioural CS category was the category most closely linked to thoughts or behaviours specifically aimed at managing mood (including strategies such as not dwelling on negative thoughts, dealing with stressors and reflecting on positives) while the daily activities category was most in contrast to the idea of 'coping' (including activities such as cooking, child care and shopping) when compared to previous literature. All participants in a medium mood were significantly more likely to select daily activities and significantly less likely to select cognitive/behavioural CS, suggesting that when mood is relatively stable people are more likely to intend go about their normal routine rather than employ specific strategies to manage mood. When in a high mood, all participants were significantly more likely to select social interaction CS (and enjoyable activities) but significantly less likely to implement social interaction CS. All participants with the intention to go up were significantly more likely to *select* cognitive/behavioural, sleep and social interaction CS but were significantly more likely to *implement* daily activities and significantly less likely to *implement* social interaction than participants with the intention to stay same/go down. Thus, to increase mood, people reported that they would engage in behaviours aimed at altering mood but actually tended to go about their normal daily lives. These results highlight the importance of distinguishing between what people say they will do to manage mood (selection) and what they actually to do (implementation) to avoid over-emphasising the selection of strategies that are not implementation. Previous research has not distinguished between selection and implementation and so when asked what they have done in response to early warning signs (Lam & Wong 1997; Lam et al., 2001) participants' answers about strategies implemented in the past may have been contaminated with what was *selected* for implementation in the past.

The results from the selection and implementation stages should be interpreted within the confines of several limitations. Firstly, there was not enough variability in some of the CS categories to analyse them using multi-level modelling, therefore logistic regression without the repeated measures structure was used. This type of analysis does not take into account that fact that multiple responses could have come from the same participant and therefore should be viewed with caution. Further, low response rates for a number of the categories precluded formal analysis altogether.

Secondly, due to large amounts of missing data and an association between intention and current mood, current mood and intention were not examined across groups for the categories analysed using a MLM and were not examined at all for the categories analysed using logistic regression. Therefore, whether the CS reported were likely to achieve one's desired intention was not fully investigated. What might be a good strategy to elevate mood may be a poor one to decrease mood and vice versa. This deserves attention in future research.

Finally, a problem with studying coping in BD, and therefore with this study, is defining what constitutes 'coping'. We all react behaviourally to mood changes and so some of the CS reported in this study may actually be reactions to feeling high or low rather than intentional implementation of selected CS. Whether an individual would say they were using an activity to 'cope' or experiencing it as a symptom of high or low mood may depend on how the individual understands the term 'coping'. A number of the activities in the daily activities category, in particular, do not seem to fit with what we might expect to be 'coping' strategies. By asking open-ended questions and asking these questions during a typical week when participants were going about their daily lives, it seems unsurprising that the majority of strategies reported by both groups were synonymous with daily activities. The daily activities category was very broad which may have limited the ability to identify common CS used by people with and without BD, group differences in the implementation of selected CS

and the ability to draw links with existing literature regarding coping in BD. It is likely that some of the activities included in the daily activities category were more relevant to coping than others. Therefore, with more participants it would be interesting to unpack the broad daily activity category to identify whether specific daily activities were used in different ways to others. Despite the limitations introduced by high response rates related to the daily activities category it should be noted that participants were specifically asked what they intended to (selection) and had done (implementation) *to modify mood* in line with their intention to make mood go up/down/stay the same. Therefore, if what people with and without BD did most often in daily life to manage mood was carry out daily activities this suggests that until people experience an obvious shift in mood, they may be less likely to consciously implement CS. This may work well for people without a mood disorder, but for people with BD who experience mood fluctuations of greater magnitude, taking this reactive rather than proactive approach may increase risk of relapse.

3.5.3.5 Stage 5a: Evaluation

Although there were no significant group differences in evaluation of current mood, both groups were significantly more likely to evaluate mood as gone up if intention was to go up, suggesting that both groups were able to evaluate mood management cycles successfully. The evaluation of mood management cycles as an entire process in BD has not been specifically examined previously and due to large amounts of missing data, would require further testing in future research.

3.5.3.6 Stage 5b: Repetition

The repetition stage proved difficult to analyse due to a lack of variability in the data and low counts for the majority of CS. Only 3 CS were formally analysed for these reasons, namely daily activities, socialising and exercise CS. Repetition of successful CS appeared to be

higher in the BD group according to frequency. However, formal analysis revealed that controls used a significantly higher proportion of daily activities and exercise successfully compared to the bipolar group. Therefore, the bipolar group only appeared to use these CS successfully more often than controls due to higher overall frequencies of CS use. This result highlights that without formal analysis, group differences in the proportion of CS used successfully may be falsely reported. Further, even with the analyses performed on the 3 CS with higher counts, there were limitations because the repeated measures structure was not included. Therefore, the analysis did not account for multiple responses from the same participant. For these reasons no conclusions can be drawn regarding group differences in the rate of repetition of successful mood management cycles and future research is needed to test the hypothesis related to the repetition stage of the mood management model.

3.5.4 Implications for treatment

It should be acknowledged that this research was unable to establish any causal patterns to the processes involved in mood management due to a cross-sectional design. Thus, prospective research is required to test the causal relationship between mood management processes in BD and risk of relapse before the true impact of the following implications is revealed.

The current results suggest that even in normal, everyday life, when current mood is not particularly high or low, people with BD still experience significantly more variability in mood and, perhaps accurately, also interpreted a shorter duration of current mood state than people without BD. Managing minor fluctuations in daily life may be as important as managing more extreme mood changes because these fluctuations may be hard to live with and, as this study showed, impact on how mood is interpreted and the strategies employed to manage mood in BD.

The way in which people with BD interpret minor changes in mood that are typical in everyday life may increase risk of relapse and should therefore be a focus for interventions in BD. Specifically, interpretations regarding personal control, comprehensibility and internal attributions of depressive and hypomanic experiences may impact on outcome in BD. To increase a sense of personal control in BD, treatment interventions should promote self-management techniques that allow people with BD to take control over their lives and emotions to increase a sense of autonomy while still allowing a collaborative relationship between patient and therapist. In order to increase comprehensibility regarding BD, a formulation of what is happening for an individual could be developed during therapy that makes sense to the individual and provides them with a working model to manage their mood. Additionally, interventions could also promote the positive aspects of BD that were perceived by people with BD in the current research, and acknowledge these positives as a potential factors in ambivalence towards treatment.

Psychoeducation provides a structured way to promote self-management, increase control and educate people about their illness. Psychoeducation has been shown to be effective at reducing relapses in BD (Colom & Vieta, 2006; Colom at al., 2009). Interventions, such as CBT may also be advantageous in altering maladaptive appraisal styles in BD which attribute blame for both hypomanic and depressed mood to the self rather than external factors.

3.5.5 Limitations

The current findings should be interpreted within the confines of several limitations. Firstly, no formal power calculation was conducted and therefore statistical power may not have been sufficient to reject the null hypothesis for some stages i.e. differences between groups could have been missed because there was large variability between groups or because effects were small. Further, a power calculation for ESM data would have been

useful in order to estimate the number of participants needed for analysis of some of the latter stages in which temporal patterns were explored across alerts e.g. strategy implementation at time 2 depending on intention and mood at time 1. A retrospective power calculation was not conducted for three reasons. Firstly, power calculations are helpful as a guide in *planning* studies rather than in interpreting results (once the study has been carried out, the results have already been obtained and should be interpreted accordingly). Secondly, confidence intervals were reported which can be used to indicate the likely size of possible effects, even if results are not significant. Indeed, Hoenig & Heisey (2001) stated that "Once we have constructed a confidence interval, power calculations yield no additional insights" (page 4). Finally, power calculations are very complex due to the multilevel structure of the data requiring sample sizes at all levels to be considered i.e. at the participant level the number of participants and at the observation level the number of observations per participant. Few studies using multi-level data have conducted formal power calculations prior to data collection for this reason (Dedrick et al., 2009) and consequently there is a lack of literature outlining methods for calculating power in ESM studies and little consensus regarding the utility of doing so. With the growing interest in ESM, more literature is likely to be published regarding power calculations for hierarchical data. Therefore, future research should aim to replicate the current findings following a formal power calculation.

Secondly, consideration should be given to the large amounts of missing data, especially for stages that specifically asked about mood management techniques i.e. intention, selection, implementation and evaluation stages. Participants in both groups were more likely to miss the intention item when current mood was medium. Perhaps people are less motivated to manage, or are unaware of mood management processes, when mood is relatively stable. Exploration of patterns of missing data for the selection and implementation items revealed that these items were not more likely to be missed by either

group due to one's intention or due to current mood for controls and for the bipolar group when responding to the *selection* item. However, bipolar participants were more likely to miss the *implementation* question if they were in a medium mood. When mood is stable, people with BD may be less aware of the CS implemented to keep mood on an even keel. Given that people with BD experience extreme fluctuations in mood, when mood is stable this group may be particularly unaware of, or unmotivated to attend to, mood management processes.

Given the general lack of patterns to the missing data, perhaps people missed the selection and implementation items because they were open-ended questions that required participants to be aware of mood management strategies and this may be particularly hard to tap into in daily life when mood is relatively stable. The evaluation item came directly after the implementation item in the diary and asked about the impact of the implemented strategy. Therefore, if the implementation item was missed, the evaluation item was also more likely to be missed. The fact that the control group missed these items more often than the bipolar group is not surprising given that control participants are less likely to be aware of mood management strategies based on never experiencing extreme mood changes that require vigilance to these processes. Electronic ESM devices could be used in future research to preclude participants from continuing with questions if they miss a response.

Due to missing data regarding CS, sample sizes were decreased for the analyses of the selection, implementation and repetition stages. Therefore some of the analyses for these stages were conducted without a repeated measures structure. Caution should be taken when interpreting the results of single-level analysis because this type of analysis cannot account for the repeated measures structure of the data, therefore multiple responses could be coming from the same participant. Multi-level modelling is specifically designed to deal with this problem and was used in all analyses where sample sizes and variability in the outcome measure were sufficient.

Thirdly, due to constraints on the recruitment period, bipolar and control samples were not matched on demographics such employment. While this means the sample was more generalisable because BD samples experience more difficulties regarding employment (Judd et al., 2008), experimental comparisons may be confounded by such group differences. Further, participants with BD were not excluded based on comorbidities or medication status because this represented a more ecologically valid sample. Control participants were not taking any prescribed medication for psychiatric problems. Therefore medication could confound any group differences found by altering mood in the bipolar sample only. However, this study aimed to examine mood management in daily life and so if taking medication was part of an individual's normal daily routine then group comparisons should be made regardless of medication use. Additionally, people who volunteer for, and compete, ESM studies may not be representative of the general population from which they are drawn. Personal and environmental factors (e.g. work demands, unfamiliarity with technology) may preclude some people from taking part (Moskowitz et al., 2009; Palmier-Claus et al., 2011; Shiffman et al., 2008). Indeed, in the current control sample the number of female participants, participants in employment and participants married was higher in the current sample than would be expected within the general population. The mean age of BD onset in the current sample was higher than previously reported (e.g. Kogan et al., 2004; Oswald et al., 2007; Suppes et al., 2001) and the current bipolar sample may not represent the general population of people with BD with regards to clinical history (e.g. those with a recent diagnosis or first time episode) but may represent a more chronically unwell sample of people with BD. Thus, observed group differences could have been affected by these issues and so further research is needed to identify the impact of these potential confounds on the group differences observed.

A fourth consideration relates to the implications of controlling for current mood state in statistical analyses. Without controlling for current mood people with BD appeared

to interpret less positive consequences and more concern related to current mood, thus painting a rather negative picture of BD and ignoring the positive aspects of BD. However, whether current mood should be controlled for in research regarding mood management in BD is debatable. If we control for current mood state are we, in part, controlling for having BD (i.e. if BD is partly defined by the increased levels of negative affect, by controlling for lower affect in BD we could be artificially increasing scores on the positive aspects)? Is it more meaningful to examine cognitions with or without controlling for current mood? This study was not designed to answer these questions but has shown the important implications of considering mood at the time of assessment, therefore indicating an important avenue for future research. Using ESM, future studies could roll this procedure out over different mood states to explore in more detail how current mood affects mood management in BD.

Finally, a number of limitations relate to the study design. Even within ESM studies that aim to focus on momentary responses, some ESM assessments involve some degree of retrospection (e.g. participants were asked 'since the last alert have you done anything with the intention of modifying your mood?' to assess coping strategy implementation) and data is essentially still self-report data and therefore open to the same limitations associated with self-reports e.g. memory biases. Additionally, a number of analyses focussed on aggregation of multiple assessments by the same group regarding the same variable over the study week and were therefore cross-sectional in nature and unable to establish cause. However, the self-reports were given immediately or very close to when the phenomena occurred and the ESM diary was kept short to ensure assessments were answered as close to the time at which they occurred as possible. Therefore biases were less of a concern. Further, aggregating across assessments in ESM studies is suggested to be a more reliable method than one-off assessments due to multiple measurements and also more valid due to avoidance of recall bias and increased ecological validity (Shiffman et al., 2008; Wenze & Miller, 2010). It is important to test causality through prospective intervention studies to

examine whether changing any of the variables associated with the mood management stages impacts on relapse in BD.

Another concern for ESM research is distortion of results by reactivity (Moskowitz et al., 2009; Palmier-Claus et al., 2011; Shiffman et al., 2008; Trull & Ebner-Priemer, 2013; Wenze & Miller, 2010). Akin to a number of previous studies (e.g. Hufford et al., 2002), the current study found little evidence of reactivity according to reports of how much the study influenced mood.

Shiffman et al. (2008) highlighted that most questionnaires were not designed to assess momentary phenomena and have therefore been adapted for ESM studies or new measures have been created. In the current study the BIPQ, HIQ and IDQ were all adapted for the current research to ask about state (current mood) rather than trait phenomena. These measures have not been validated as state measures but were used due to lack of availability of state measures. For the same reason, new items were created and acceptability was found to be good in a pilot study. However, it should be noted that by using a single scale to measure current mood ('overall happy' item) for some of the mood management stages, it was assumed that participants were reporting mood on a one-dimensional scale (up/down/same). However, mood is multidimensional i.e. it goes up down and sideways (e.g. anxious, calm etc). Assessing current mood in ESM research requires further attention.

A final limitation regarding the procedure employed was that using a paper-and-pencil procedure meant that reported times of completion could not be verified. However, Knowles et al. (2007) found no evidence that participants tried to falsify entry times and participants in the current study left entries incomplete when an alert was missed (beyond the require time) as instructed.

3.5.6 Future directions

Replicating results following a formal power calculation is important. Using a larger sample, future research could examine the influence of treatment, medication and comorbidities in BD on mood management processes. Future research should also aim to match groups in socio-demographic data, and could include a unipolar depressed control group matched on symptomatology to allow examination of mood management processes specific to BD.

This study only included euthymic bipolar participants and focused on mood management of emotions that occurred in everyday life. With particular attention to ethical considerations, future studies could examine whether findings are generalisable to the mood management of more extreme mood symptoms to improve knowledge on mood management following the onset of a mood episode. Specifically, using a within-person design future research could explore differences in mood management when people with BD are entering an episode of BD and when they are not going into episode to understand how processes differ depending on mood state. Previous ESM studies have included symptomatic bipolar participants (Depp et al., 2010; Pavlickova et al., 2013). By rolling the current procedure out over different mood states the effect of current mood on mood management in BD could be explored in more detail.

A number of final suggestions for future research relate to the current study design. This study was conducted over a short period of time (one week) and so cannot provide comment on how mood management strategies predict relapse in the longer term. Longitudinal studies are needed to test causal relationship between mood management processes in BD (e.g. interpretations and coping) and risk of relapse. Further, the validity of the measures used in this study should also be tested in future research and it would be useful to ultimately validate a set of ESM measures that can be used for all ESM assessment of the same construct (e.g. mood) or disorder (e.g. BD). Finally, due to limited resources,

paper-and-pencil diaries were used in the current study which precluded verification of whether responses made were truly momentary and allowed participants to miss out certain questions. Replicating the current results using electronic devices that provide a time-stamp and preclude participants from missing items would be advantageous.

3.6 Conclusions

Despite the limitations discussed, this study provides an important step towards highlighting specific stages at which people with and without BD differ in mood management during everyday life. Specifically, people with BD experienced significantly more variability in mood compared to controls outside of episode, during a normal week of daily life. People with BD also interpreted more positive consequences, less personal control, less comprehensibility, a shorter duration of mood and used more self-dispositional appraisal styles than controls when current mood was controlled for in analyses. In an attempt to manage mood it emerged that the strategies *selected* were not always the ones that were *implemented*. Further, people with BD appeared to be actively trying to manage mood, or were more aware of managing mood, compared to controls. Future research following a formal power calculation is needed to confirm the effects found and test whether the differences found play a causal role in the escalation of mood into relapse.

CHAPTER 4: STUDY 2

Mood management: A computer-based questionnaire study

4.1 Abstract

Demonstrating differences between euthymic bipolar participants and healthy controls regarding the psychological processes that underlie the self-regulation of mood may inform psychological interventions. Based on the SRM (Leventhal et al., 1984), stages of mood management (detection, interpretation, intention and coping strategy selection) were identified and examined.

Fifty bipolar and fifty control participants were randomly allocated to either a positive or negative MI condition. Successful MI was based on ratings of current mood assessed using visual analogue scales completed before and after mood induction. Following successful MI, participants completed a number of computer-based questionnaires about current mood, mood interpretation and potential strategies for mood management.

MI was successful for 60% of the control (n=30) and 58% of the bipolar (n=29) samples and only these participants were included in analyses. Induction of negative mood was more successful than induction of positive mood for both groups (average negative MI success rate=74%, average positive MI success rate=44%). Significant differences between groups were found at the interpretation (stage 2) and coping strategy selection (stage 4a) stages of mood management. Following an induced change in mood, people with BD interpreted significantly less personal control over mood, less comprehensibility regarding mood, more concern about mood and made more self-dispositional depressive appraisals regarding the cause of current mood than controls. People with BD selected significantly more coping styles associated with negative rumination and dampening of positive emotion, while controls selected significantly more adaptive coping styles regardless of MI condition.

The differences found at these stages may indicate why symptom escalation occurs for people with BD. Potential implications for treatment are discussed. Future research following a formal power calculation is needed to confirm the effects found and test whether the differences found play a causal role in the escalation of mood into relapse.

4.2 Introduction

The SRM (Leventhal et al., 1984) provides a useful framework to describe how individuals process illness information and has been identified as a potentially useful framework for understanding bipolar mood fluctuation (Lobban et al., 2013). However, the specific stages have not been defined or tested with this population. To this end, a 5 stage model of mood management was proposed in the current research (based on the SRM), with the aim of identifying differences between people with and without bipolar mood changes at any of the identified stages (see Figure 12).

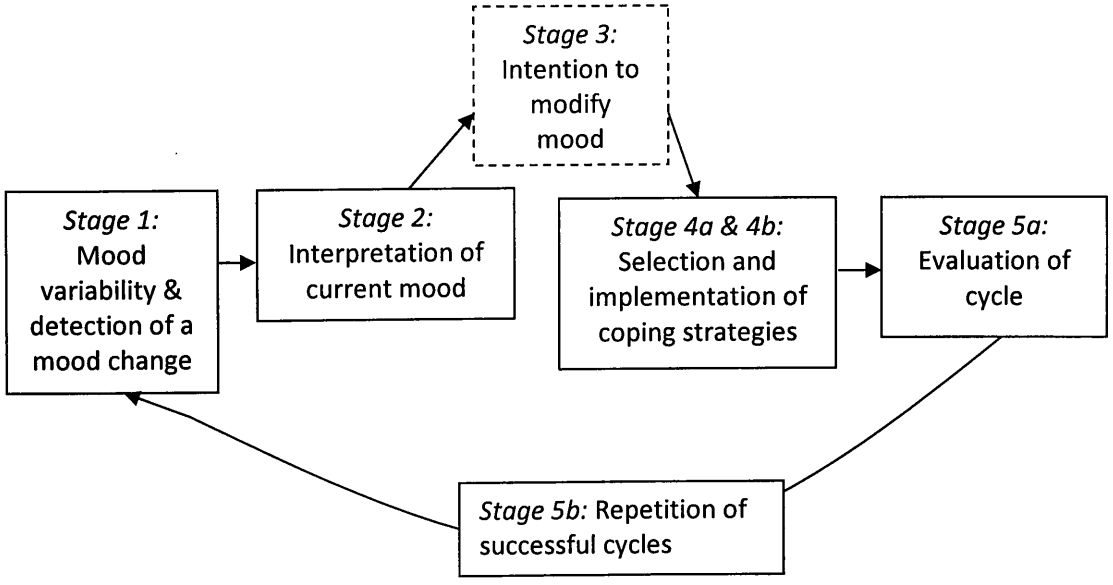


Figure 12: The mood management model

This study aimed to test the first 4 stages (detection, interpretation, intention and selection) of the mood management model using a mood induction procedure (MIP) to examine whether there are differences in this process of self-regulation between people with and without a diagnosis of BD following an induced change in mood. Only the first 4 stages of the 5 stage mood management model were examined in the current study for practical reasons. Stages 4b to 5b were not examined because participants were not free to implement coping strategies (stage 4b) due to the study environment and therefore were unable to evaluate (stage 5a) and repeat (stage 5b) such strategies. These stages were tested elsewhere (see Chapter 3 for ESM study). Using a MIP mood changes could be induced in a controlled way, thus allowing examination of each stage of the mood management following an induced change in mood which could improve understanding of why some individuals experience mood episodes characteristic of BD. See Section 2.2 for details regarding MI in BD.

The literature regarding BD was reviewed in relation to each stage of the mood management model framework in Section 1.5 and so will not be repeated here. The specific pages of reference for the literature pertaining to each of the stages tested are listed below.

Stage 1-Time to detection: Section 1.5.1.2, page 79

Stage 2-Interpretation: Section 1.5.2, page 82

Stage 3-Intention: Section 1.5.3, page 91

Stage 4b-Selection: Section 1.5.4.1, page 95

4.2.1 Aims and hypotheses

We are all hypothesised to go through the stages of mood management following a mood change. What was under scrutiny here was whether there are differences in this

process of self-regulation between people with and without a diagnosis of BD. Stages 1-4 of the mood management process were tested separately and therefore discrete hypotheses, based on the existing literature reviewed in Section 1.5, are presented in Table 45 for each stage. Differences at any stage in the mood management process would have been interesting and would require further testing.

Table 45: Study 2 Aims and Hypotheses

Stage	Hypotheses
1. Detection	Following MI there will be a difference between people with and without BD in time to detection of a mood change.
2. Interpretation	Following MI... ...people with BD are more likely to report more positive and negative consequences related to mood than controls. ...people with BD are more likely to perceive less personal control over their mood than controls. ...people with BD are more likely to report more concern related to mood than controls. ...people with BD are more likely to report less comprehension regarding their mood than controls. ...people with BD are more likely to predict a longer time line for their mood than controls. ...people with BD are more likely to make positive self-dispositional appraisals than controls. ...people with BD are more likely to make negative self-dispositional appraisals than controls.
3. Intention	People with BD are more likely to intend to modify mood up than controls following positive MI. Both groups are likely intend to modify mood up following negative MI.
4a. Selection	Following MI... ...people with BD are more likely to report negative rumination coping styles than controls. ...there will be no group differences in reports of coping styles related to dangerous activities. ...controls are more likely to report adaptive coping styles than people with BD. ...people with BD are more likely to report dampening and positive rumination coping styles than controls.

4.3 Method

4.3.1 Participants

4.3.1.1 Sample size

No previous studies had used this methodology with all of the current measures associated with each stage, therefore a meta-analysis combining the effect sizes from previous studies to estimate the population effect size was not possible. For this reason, the current study aimed to undertake an exploratory approach using a convenience sample. Study 1 (see Chapter 3) was ideally suited to provide access to participants with bipolar disorder at additional low cost and effort. A sample size of 60 participants (30 control and 30 bipolar) gave a sample size large enough to avoid sparse data in the logistic regression analyses and contingency tables, and small enough to be able to conduct the study within the time and resources available. Note that the original ethics application was amended following calculations of MI success rates during this initial stage of the study to recruit 100 participants (50 control and 50 bipolar) rather than 60 (30 from each group) to allow for mood induction success in only 60% of the sample recruited.

4.3.1.2 Recruitment

Twenty control and 30 bipolar participants were recruited via the Study 1 (Chapter 3). To reach target numbers, a further 30 control and 20 bipolar participants were recruited via NHS services, support organisations and the wider community (see Section 2.6 for overview of PhD structure and recruitment). The study was presented to health professionals and service users and advertised through posters and email. Participants were also recruited through the Spectrum Centre participant panel and other studies at Lancaster University, and via GP mail outs. See Appendix 11 for final recruitment numbers.

4.3.1.3 Inclusion and exclusion criteria

The inclusion and exclusion criteria for the current study are presented in tables 46 and 47.

Table 46: Study 2 Inclusion Criteria

Group	Inclusion criteria
General (BD and control)	• Grid Hamilton Rating Scale (Grid-HAMD; Williams et al., 2008) score ≤ 12 and Bech-Rafaelsen Mania Scale (MAS; Bech, Rafaelsen, Kramp & Bolwig, 1978) score ≤7 to ensure participants were not experiencing significant mood symptoms. • No physical brain injury due to the difficulty to diagnose BD. • No current suicide plans or high suicide intent to avoid adverse reactions to the MIP. • Able and willing to give written informed consent to the study as required by the ethics committee. • Able to communicate in written and oral English to a sufficient level to allow the participant to complete the measures because the current measures have not been validated in other languages. • Aged 18 years old or over due to BD diagnostic validity queries in children and adolescents.
BD	• Structured Clinical Interview for DSM-IV (SCID; First et al., 1997) verified diagnosis of primary BD I or II.
Control	• A score of <0.5 SD above the sample mean on the Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986) to exclude people with hypomanic personality which may predispose an individual to BD.

Table 47: Study 2 Exclusion Criteria

Group	Exclusion criteria
Control	• Lifetime occurrence of a manic or mixed affective episode because the experience of these mood states indicates a likelihood of meeting research diagnostic criteria for BD I. • Lifetime occurrence of a hypomanic *and* depressive episode because the experience of both of these mood states indicates a likelihood of meeting research diagnostic criteria for BD II. • Lifetime clinical diagnosis of a serious and enduring mental health disorder i.e. bipolar disorder I or II, schizophrenia, personality disorder, dementia. • Any other mental health problem in the last 2 years (a sufficient amount of time to assume problems are not current).

4.3.1.4 Sample description and representativeness of the general population

Table 48 displays the socio-demographic data for the current control and bipolar samples.

Table 48: Study 2 Control and Bipolar Socio-dDemographic Data

Descriptive	Control eligible (n=30)	Bipolar eligible (n=29)	Test statistic (df)	df	p
Gender ratio (M/F)	5/25	14/15	X^2=6.75	1	0.01
Age, mean (SD)	33.03 (8.83)	46.48 (10.30)	t=-5.34	56	<0.001
Highest level of education, n (%)			X^2=5.14	3	0.16
Primary	0	1 (3%)			
Secondary	2 (7%)	6 (21%)			
Further	6 (20%)	9 (31%)			
Higher	22 (73%)	13 (45%)			
Missing	0	0			
Employment status, n (%)			X^2=15.38	1	<0.001
Working (Paid PT/FT*)	28 (93%)	13 (31%)			
Not working	2 (7%)	16 (55%)			
Marital status, n (%)			X^2=5.73	2	0.06
Single	11 (37%)	10 (34%)			
Married/Cohabiting	18 (60%)	12 (41%)			
Separated/Divorced/Widow	1 (3%)	7 (24%)			
Living arrangements, n (%)			X^2=1.93	2	0.38
Partner with/without others	18 (60%)	13 (45%)			
Alone	5 (17%)	9 (31%)			
Other	7 (23%)	7 (24%)			
Ethnicity, n (%)			X^2=0.09	1	0.76
British	25 (83%)	25 (86%)			
Other	5 (17%)	4 (14%)			

*PT=part time, FT=full time

4.3.1.4.1 Representativeness of the control sample (socio-demographics)

The number of female participants, participants in employment and participants married was higher in the current sample than would be expected within the general population. Mean age and ethnicity were relatively representative of the general population (see Chapter 3, Section 3.3.1.4.1 for details of references).

4.3.1.4.2 Representativeness of the bipolar sample (socio-demographics)

The mean age of the bipolar sample in the current study was similar to that reported previously in large cohorts of people with BD. Employment status in the current sample

represents what would be expected in the general population of people with BD. In the line previous reports there was little difference between the number of people with BD who were married/cohabiting or single in the current sample. The ethnicity of the current sample was representative of the general population of people with BD (see Chapter 3, Section 3.3.1.4.2 for details of references).

4.3.1.4.2 Representativeness of the bipolar sample (clinical data)

Table 49 displays the clinical data for the bipolar sample only. The mean age of BD diagnosis was 33 years and the mean number of days since last episode was approximately 1 year, 3 months. According to scores on the Grid Hamilton Rating Grid (Grid-HAMD; Williams et al., 2008) and Bech-Rafaelsen Mania Scale (MAS; Bech et al., 1978) administered at baseline, no participants were in an episode of BD. The entire bipolar sample was taking some form of medication.

The higher proportion of BD I compared to BD II and the prevalence rates for additional axis I disorders in the current sample were expected. However, the mean age of BD onset in the current sample was higher than previously reported. In line with previous findings, the majority of people with BD were expected to be taking some form of medication and to have received some form of treatment (see Chapter 3, Section 3.3.1.4.3 for details of references).

Although the numbers of depressive and manic/hypomanic episodes reported were comparable to those reported previously (Suppes et al., 2001) these participants had to present for outpatient treatment to be recruited and the participants in the current study had to be willing to participate in a MI study. Therefore, these participants may not be entirely reflective of the general population of people with BD (e.g. those with a recent diagnosis or first time episode) but may represent a more chronically unwell sample of people with BD.

Table 49: Study 2 Bipolar Sample Clinical Descriptives

Descriptive	n	%
BD type, I/II	22/7	76/24
BD I with mood congruent psychosis		
No	11	38
Yes	18	62
Additional axis I diagnoses		
No additional axis I diagnosis	12	41
Current additional axis I diagnosis	9	31
Past additional axis I diagnosis	8	28
Treatment focussing on MM* (n, %)		
No treatment	7	24
Current treatment	11	40
Past treatment	10	34
Information missing	1	3
No. depressive episodes		
0	2	7
1-6	8	28
7-11	5	17
12-29	5	17
30+	9	31
No. manic/hypomanic episodes		
1-6	9	31
7-11	3	10
12-29	7	24
30+	10	34
No. hospitalisations		
0	10	34
1-6	10	34
7-11	4	14
12-29	4	14
30+	1	3
Medication		
Monotherapy	6	21
Combination therapy	23	79
Antidepressant	9	
Lithium	10	
Valproate	12	
Lamotrogine	7	
Benzodiazepines/Hypnotics	5	
Antipsychotics	22	
Meds for physical problems	16	

*MM=mood management

4.3.2 Measures

4.3.2.1 Socio-demographic measures

1. Socio-demographic data sheet (available on request)

All participants were asked to provide general information such as age, employment status and education. Participants with BD were also asked to provide some clinical details such as time since last episode, current medication and number of previous episodes.

4.3.2.2 Screening measures

1. The Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986)

See Chapter 3, Section 3.3.2.2 for details.

2. The Structured Clinical Interview for the DSM-IV (SCID; First et al., 1997)

See Chapter 3, Section 3.3.2.2 for details.

3. Grid Hamilton Rating Grid (Grid-HAMD; Williams et al., 2008)

The Grid-HAMD (available on request) is a modified version of the Hamilton Depression Rating Scale (HAMD; Hamilton, 1960), which allows evaluation of both the intensity and frequency of depression symptoms. The Grid-HAMD was used to screen participants for significant symptoms of depression (HAMD score ≥12), which would exclude them from the study.

4. Bech-Rafaelsen Mania Scale (MAS; Bech et al, 1978)

The MAS (available on request) is a researcher rated interview evaluating severity of manic symptoms. The MAS was used to screen participants for significant symptoms of mania (MAS score ≤7), which would exclude them from the study.

4.3.2.2.1 Grid-HAMD and MAS thresholds

Thresholds for inclusion were set to exclude participants with more than very mild symptoms. Studies have found that bipolar participants scored well below the thresholds set (e.g. Paykel, Abbott, Morriss, Hayhurst, & Scott, 2006), as did a pilot to the current study. Therefore, large numbers of participants were unlikely to be excluded based on the thresholds set, yet these thresholds were conservative enough that participants experiencing more than mild symptoms of depression or mania (which may be part of everyday life) were excluded. There was 100% inter-rater agreement regarding thresholds for inclusion on the Grid-HAMD and MAS.

4.3.2.3 Computer programme measures

The computer programme contained the following measures to assess stages 1-4a of the mood management process. Research suggests that MI effects are limited (e.g. Frost & Green, 1982) therefore, all questions on the computer programme appeared as closed questions in order to keep the programme short. The questions included in the computer programme can be seen in Appendix 12 and are explained below.

4.3.2.3.1 Visual Analogue Scale (VAS)

A VAS was used to measure current mood before and after MI and following completion of the study measures. The VAS used in the current study was based on previous research using mood induction with a bipolar sample (Mansell & Lam, 2006; Wright et al., 2005). The VAS was a 100mm line marked with 'sad/depressed/down' (-50) at one end and 'happy/high/manic' (+50) at the other, with 'normal' (0) in the centre. Using a VAS has the advantage of providing a quantitative measure of mood change that is quick to administer. Therefore, the VAS can be repeated during the study without taking too much time and can easily be incorporated into a computer programme.

4.3.2.3.2 Stage 1: Detection

Due to a lack of pre-existing measures of mood change detection during a computer-based MI study, this measure was designed specifically for the current study. Participants were instructed "During the computer programme please press the button in the top right corner of the computer screen when you start to feel a change in your mood". The button was labelled "my mood has changed". Feedback from a pilot study suggested that this item was appropriately worded and understood.

4.3.2.3.3 Stage 2: Interpretation

4.3.2.3.3.1 The Brief Illness Perception Questionnaire (BIPQ; Broadbent et al., 2006)

An amended version of the BIPQ was used to assess cognitive illness representations regarding consequences, timeline, personal control, illness comprehensibly and concern. The same amended BIPQ items that appeared in the ESM diary in Study 1 appeared in the computer programme for Study 2. This measure is fully explained in Chapter 3, Section 3.3.2.3.2.1 and will therefore not be repeated here.

4.3.2.3.3.2 The Hypomanic Interpretations Questionnaire (HIQ; Jones et al., 2006a) and the Interpretations of Depression Questionnaire (IDQ; Jones & Day, 2008)

To assess the cause cognitive dimension items from the HIQ and IDQ were incorporated into the computer programme. The same HIQ and IDQ items that appeared in the ESM diary in Study 1 appeared in the computer programme for Study 2. These measures, and the specific items used, are fully explained in Chapter 3, Section 3.3.2.3.2.2 and will therefore not be repeated here.

4.3.2.3.4 Stage 3: Intention

Due to a lack of pre-existing measures of intention to change current mood during a computer-based MI study, this measure was designed specifically for the current study. Participants were asked "Would you like to make your current mood Go up/Go down/Stay the same". Feedback from a pilot study suggested that this item was appropriately worded and understood.

4.3.2.3.5 Stage 4a: Selection

The Responses to Positive Affect Scale (RPA; Feldman et al., 2008) and the Response Style Questionnaire (RSQ; Nolen-Hoeksema, 1991)

The RPA and RSQ assess participants' selection of strategies to cope with elevated (RPA) or depressed (RSQ) mood. The RPA and RSQ have been validated and factor analysed in previous research (Feldman et al., 2008; Knowles et al., 2005). To decrease the number of items contained in the computer programme, only the two most highly loading items for each of the 3 themes from the RPA (emotion-focussed positive rumination, dampening and self-focussed positive rumination) and RSQ (negative rumination, adaptive strategies and dangerous strategies) identified through previous factor analysis studies using undergraduate samples (Feldman et al., 2008; Knowles et al., 2005) were included in the computer programme. All items were measured on a scale of 1 (not at all likely) to 4 (very likely). To ensure that the RSQ/RPA items captured variability in responses from control participants, a brief pilot study was conducted as part of the current research. Control participants showed variability in responses across the scale.

4.3.3 Procedure

Approval was granted from the Preston NHS Research Ethics Committee (11/NW/0408). The study was then independently peer reviewed before being adopted by the Mental Health Research Network (MHRN) (110790).

Following verbal consent, an initial pre-screen (available on request) was conducted via telephone leading to a full screening interview (available on request) and relevant screening questions from the SCID (First et al., 1997) if appropriate. If participants answered positively to any of the individual SCID screening questions, the corresponding sections of the SCID interview were also completed. Analogue participants were asked to complete the Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986) via email to confirm eligibility as a control participant. For eligible participants, a study appointment was made. Prior to the study appointment, eligible participants were randomly allocated to a positive (25 participants from each group) or negative (25 participants from each group) MI condition using R statistical software (R Development Core Team, 2011).

At the study appointment, written informed consent (available on request) was taken and participants were screened for significant mood symptoms using the Grid-HAMD and the MAS. Bipolar participants who could not be included due to scores above threshold were offered the opportunity to take part once their symptoms have reduced. The researcher explained the study procedure and how to use the laptop computer and answered any questions.

Depending on condition, participants were asked to listen to 20 second clips of 2 pieces of music (Vivace by Handel and Vamos by The Gipsy Kings in the positive condition, and Adagio for Strings by Samuel Barber and Adagio in G Minor by Albinoi in the negative condition) on a laptop computer before selecting the piece that made them feel the most 'melancholy/sad' (negative condition) or 'happy/cheerful' (positive condition). All participants were provided with headphones to block out external noise and decrease

distraction. Participants were then asked to indicate current mood on a VAS on the computer ranging from 'sad/depressed/down' to 'happy/high/manic'.

Due to success in previous research using MI with bipolar samples (e.g. Mansell & Lam, 2006; Wright et al., 2005) and a pilot study, a film MI procedure was used (see Section 2.2 for a review of MI in BD). Music was incorporated to boost MI effects during the computer programme. Instructions were displayed on the computer screen for 30 seconds while the selected music played. Participants were asked to imagine how the main character in the film clips was feeling and absorb themselves in the emotions generated by the film clips. Mood induction was explicit because it was deemed unethical to induce a mood change in a group of participants with a mood disorder without informed consent. Participants in the positive condition watched 3 minutes of 'Bear Necessities' from The Jungle Book and 1 minute of 'Del falls into bar' from Only Fools and Horses. Participants in the negative condition watched 3 minutes of Bambi where Bambi's mother dies and 1 minute of White Fang where White Fang dies.

Participants then completed a second VAS. In both conditions, if the participants' mood had not changed by at least 8 points in the correct direction (direction synonymous with MI condition: up if positive and down if negative), participants saw a third film clip (from The Muppets in the positive condition and from Kramer Vs Kramer in the negative condition). The threshold for successful MI was chosen based on the recommendations of Mansell and Lam (2006) and scores obtained in a pilot study. If mood had still not changed at least 8 points in the correct direction, participants were thanked for their time and asked to alert the researcher that the programme had finished. These participants were then debriefed.

If mood did change the required amount in the correct direction (whether after 2 film clips or 3), participants completed a number of computer-based questionnaires about current mood, mood interpretation and potential strategies for mood management. The

positive or negative music selected by the participant played while the questionnaires were completed.

Following the questionnaires, participants were asked to complete a final VAS. All participants were played positive music following the study, were thoroughly debriefed and given another opportunity to ask any questions. Verbal consent was taken to contact the participant the following day to check that no adverse effects had arisen due to participation in this study.

4.4 Results

4.4.1 The MI procedure

4.4.1.1 MI success rates

The MI procedure was successful (mood changed at least 8 points in the right direction on the VAS pre- to post-mood induction) for 30 (60%) control and 29 (58%) bipolar participants. Only these participants were included in analyses. Negative MI showed similar success rates for both groups and was higher for negative compared to positive MI (average negative MI success rate=74%, average positive MI success rate=44%), suggesting that negative mood is easier to induce than positive mood.

Comparisons were made between eligible and ineligible control and bipolar samples to identify whether differences in socio-demographic or clinical characteristics could explain why MI was unsuccessful for 20 control and 21 bipolar participants. No significant differences were found in the bipolar sample, but MI was significantly less successful in the control sample for older participants. See Appendix 13 for ineligible sample descriptives and analysis.

Baseline and pre-MI mood scores suggested MI success was not related to mood state prior to MI (see Tables 50 and 51).

Table 50: Control Sample MI Success Based on Baseline and Pre-MI Mood Scores

Mood measure	Eligible Control (n=30)	Ineligible Control (n=20)			
	Mean (SD)	Mean (SD)	t (df)	MD	p
Baseline HAMD	0.60 (1.00)	0.95 (1.05)	1.19 (48)	0.35	0.24
Baseline MAS	0.07 (0.25)	0.25 (0.64)	1.42 (48)	0.18	0.16
Pre-MI VAS positive condition	9.27 (9.81)	16.14 (11.33)	1.60 (23)	6.87	0.12
Pre-MI VAS negative condition	8.68 (10.87)	2.50 (6.75)	1.31 (23)	6.18	0.21

Table 51: Bipolar Sample MI Success Based on Baseline and Pre-MI Mood Scores

Mood measure	Eligible Bipolar (n=29)	Ineligible Bipolar (n=21)			
	Mean (SD)	Mean (SD)	t (df)	MD	p
Baseline HAMD	3.41 (2.61)	4.10 (3.49)	0.79 (48)	0.68	0.43
Baseline MAS	1.55 (1.80)	1.19 (1.57)	0.74 (48)	0.36	0.47
Pre-MI VAS positive condition	2.73 (13.95)	14.07 (17.48)	0.76 (23)	11.34	0.09
Pre-MI VAS negative condition	4.11 (11.86)	1.50 (23.90)	0.34 (22)	2.61	0.72

4.4.1.2 Baseline mood (eligible sample)

Table 52 displays baseline and pre-MI mood state data for the final eligible sample (*n*=59). At baseline the bipolar group endorsed significantly more depressive and manic symptoms than controls on the Grid-HAMD and MAS respectively. However, baseline Grid-HAMD and MAS scores were not included in the main analyses based on recommendations by Miller and Chapman (2001). Atypical mood is inherently linked to bipolar disorder and therefore controlling for mood may, in part, control for being bipolar (see Section 6.7 for a discussion regarding the utility of controlling for current mood). Further, all groups scored well below clinical thresholds suggesting minimal variability in symptoms. There was no significant difference between eligible control and bipolar samples in pre-MI VAS scores in the positive condition or the negative condition.

Table 52: Final Sample Pre-MI Mood Scores

Mood measure	Eligible Control (n=30)	Eligible Bipolar (n=29)			
	Mean (SD)	Mean (SD)	t (df)	MD	p
Baseline HAMD	0.60 (1.00)	3.41 (2.61)	-5.50 (57)	-2.81	<0.001
Baseline MAS	0.07 (0.25)	1.55 (1.80)	-4.46 (57)	1.49	<0.001
Pre-MI VAS positive condition	9.27 (9.81)	9.46 (18.68)	-0.03 (22)	-0.19	0.98
Pre-MI VAS negative condition	8.68 (10.87)	5.73 (14.17)	0.69 (32)	2.95	0.50

4.4.1.3 The effect of MI on control versus bipolar participants

To investigate whether the MI procedure affected the final samples of control and bipolar participants differently, comparisons were made using independent samples t-tests (see Table 53). The only statistically significant group differences appeared in the negative condition with bipolar participants scoring significantly lower than controls on the post-MI VAS (note that there were no significant differences between groups in mood change in either condition because bipolar participants started with more residual symptoms than controls, according to baseline Grid-HAMD scores). Post-questionnaires VAS scores revealed that, in both groups, mood scores stayed higher in the positive, and lower in the negative, condition following the post-questionnaires compared to pre-MI mood VAS scores.

Table 53: The Effect of MI on Control Vs Bipolar Participants

Mood measure	Control		Bipolar		t	df	MD	p
	M	SD	M	SD				
Mood change pos con	11.64	3.98	13.11	4.57	0.77	18	1.48	0.45
Mood change neg con	-18.68	9.46	-23.00	14.09	1.05	31	4.32	0.30
Post-MI VAS pos	20.91	11.37	17.11	12.07	0.72	18	3.80	0.48
Post-MI VAS neg	-10.00	9.55	-19.93	12.07	2.64	31	9.93	0.01
Post-quest VAS pos	13.73	7.09	11.56	9.07	0.60	18	2.17	0.56
Post-quest VAS neg	-1.68	9.20	-3.71	16.88	0.44	31	2.03	0.66

4.4.2 Descriptive statistics

Although the study aimed to match control and bipolar samples on age, gender and employment status, this was not possible due to time constraints on recruitment and recruitment through Study 1. Therefore, both groups were recruited simultaneously and so matching on socio-demographic characteristics was not possible.

Table 48 displays the socio-demographic variables for the final sample (n=59). Although there were significant differences between groups in gender, age and employment status, these variables were not included in the main analyses for several reasons. Age and gender were unlikely to affect the outcome variables tested and adding them to the multiple regression models for stage 2 (interpretation) made minimal difference to b and p-values (all

significant and non-significant effects remained the same). The literature suggests difficulties with employment are inherently linked to bipolar disorder (for review see Gilbert & Marwaha, 2013) and therefore controlling for employment status may, in part, control for having BD. Furthermore, the current study was exploratory in nature with a modest sample size, therefore including too many variables in the models would have made the models unstable. For these reasons, only variables directly associated with the current hypotheses were included. The limitations of not including covariates in the analyses will be discussed.

4.4.3 Analysis of the mood management model

4.4.3.1 Stage 1: Detection

4.4.3.1.1 Defining detection of a mood change

All participants whose mood changed at least 8 points in the right direction (direction synonymous with their MI condition: positive=up, negative=down) on the VAS following MI were said to have detected a mood change. No participant experienced mood change in the wrong direction. Unprompted detection (button press following detection of a mood change rather than prompted detection due to the presentation of the post-MI VAS) of a mood change was calculated as the time between MI starting and the button being pressed by participants whose mood changed at least 8 points in the right direction. For participants whose mood changed at least 8 point in the right direction but who did not press the button (mood recorded on the post-MI VAS), time-to-detection was calculated as the maximum time the computer programme was likely to last (15 minutes). These participants were included in analysis because unprompted detection (button press) could potentially have occurred at some later time but was not possible due to the termination of the computer programme. Furthermore, these participants *did* detect a mood change according to change in VAS scores pre- to post-MI.

4.4.3.1.2 Time-to-detection analysis and results

Survival analysis was used to measure the time-to-detection of a mood change following the initiation of MI. Cox regression analysis was used to model the effect of group, condition and a group-by-condition interaction on time-to-detection of a mood change and event occurrence (detection=1, no detection=0). This analysis method allows data to be modelled for participants who did not press the button before the study ended but whose mood changed the required amount (unprompted detection-see above). A comparison between groups of mean time-to-detection using a t-test or linear regression would not allow this data to be modelled. Furthermore, rather than just comparing groups on the proportion of event occurrences, as with logistic regression, this analysis method also allows time-to-event-occurrence be modelled.

Results are displayed in Table 54. There was no significant effect of group, condition or the group-by-condition interaction on time-to-detection of a mood change.

Table 54: Detection Results

Model	B value	p-value	95% CI lower	95% CI upper
Group	0.96	0.95	0.31	3.04
Condition	1.53	0.38	0.59	3.95
Group*Condition	1.00	1.00	0.24	4.13

4.4.3.1.3 Mean time-to-detection per group

Table 55 displays the mean time-to-detection and test statistics for *unprompted detection* only (see Section 4.4.3.1.1). Participants were not included in the tables below if: 1) their mood changed at least 8 points in the right direction but they did not press the button; 2) they pressed the button but their mood did not change at least 8 points in the right direction; or 3) they did not press the button and their mood did not change at least 8 point in the right direction.

Although controls appeared to be faster than bipolar participants in both conditions, there were no statistically significant differences between groups in unprompted detection.

Bipolar participants were faster at detection in the positive condition (*n*=5) than the negative condition (*n*=11) while controls were faster in the negative condition (*n*=11) than in the positive condition (7) but these differences were not statistically significant (bipolar: t=0.33(14), MD=00:16, p=0.45, control: t=-0.33(16), MD=00:30, p=0.75).

Table 55: Mean Time-to-Detection per Group

Condition	Control	Bipolar				
	Mean, min:sec (SD)	Mean, min:sec (SD)	t (df)	MD	CI (95%)	p
Positive	02:13 (01:57)	03:26 (01:49)	1.10 (10)	01:12	03:39, 01:14	0.30
Negative	02:30 (01:20)	02:56 (03:46)	0.36 (20)	00:26	02:57, 02:05	0.72

4.4.3.2 Stage 2: Interpretation

Multiple linear regression (MLR) was performed to predict participants' interpretation of current mood, according to the six dimensions of the amended BIPQ, based on group (BD vs. control), condition (positive vs. negative) and a group-by-condition interaction. A separate MLR model was fitted for each dimension. Note that the reference category for group was control and for condition was negative.

For the consequences dimension, MLR was initially performed taking account of whether interpretation of consequences was positive or negative to examine the direction of consequences perceived (consequences with +/-). A new variable was then calculated that ignored the minus sign and so -4 scored the same as +4 (consequences w/o +/-). MLR was repeated in order to examine the magnitude of the effect (i.e. the *amount* of consequences perceived).

Table 56: Mean Interpretation per MI Condition

Interpretation dimension	Control-Neg (n=19)	Control-Pos (n=11)	Bipolar-Neg (n=18)	Bipolar-Pos (n=18)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Consequences with +/-[1]	-0.68 (0.82)	0.82 (2.56)	-0.89 (1.53)	0.91 (1.76)
Consequences w/o +/-[2]	0.68 (0.82)	2.27 (1.27)	1.33 (1.14)	1.64 (1.03)
Personal control[3]	7.21 (1.72)	8.09 (1.58)	5.61 (2.66)	4.91 (2.12)
Concern[3]	1.89 (1.60)	1.09 (0.30)	3.11 (2.11)	2.00 (1.41)
Comprehensibility[3]	8.63 (1.30)	8.91 (1.45)	6.72 (2.35)	6.82 (2.36)
Time line[3]	4.84 (2.71)	6.55 (1.29)	4.28 (2.11)	4.64 (1.80)

HIQ-H[4]	2.42 (0.96)	2.18 (0.87)	2.78 (0.73)	2.45 (0.82)
HIQ-N[4]	2.84 (0.69)	2.55 (0.93)	2.78 (0.73)	2.36 (0.92)
IDQ-D[4]	1.21 (0.42)	1.18 (0.41)	1.83 (0.79)	1.64 (0.92)
IDQ-N[4]	1.89 (0.99)	1.91 (0.94)	2.11 (1.02)	1.82 (1.08)

Scales: [1]-4 (negatively) to +4 (positively); [2]0 to 4; [3]1 (not) to 10 (very); [4]1 (not at all) to 4 (a great deal)

Table 57 displays the results for the each dimension of interpretation tested. The statistically significant findings were as follows:

- *Direction of consequences:* Participants in the positive condition perceived significantly more positive consequences following a mood change than participants in the negative condition.
- *Magnitude of consequences:* Participants in the positive condition perceived a significantly greater magnitude in consequences following a mood change than participants in the negative condition. Control participants in the positive condition perceived a significantly greater magnitude in consequences than any other group-by-condition combination.
- *Personal control:* Control participants perceived significantly more personal control following a mood change than bipolar participants.
- *Concern:* Bipolar participants perceived significantly more concern following a mood change than control participants.
- *Comprehensibility:* Controls perceived significantly more understanding of their mood following a mood change than bipolar participants.
- *Time line:* Participants in the positive condition perceived a significantly longer timeline of mood than participants in the negative condition.
- *Cause:* Bipolar participants used significantly more self-dispositional depressive appraisals following a mood change than control participants.

Table 57: Study 2 Interpretation Results

Model	B value	p-value	95% CI lower	95% CI upper
Direction of consequences$_1$				
Group	-0.21	0.71	-1.29	0.88
Condition	1.50	0.02	0.26	2.75
Group*Condition	0.30	0.74	-1.48	2.07
Magnitude of consequences$_2$				
Group	0.65	0.07	-0.04	1.34
Condition	1.59	<0.001	0.79	2.39
Group*Condition	-1.29	0.03	-2.42	-0.15
Personal control$_3$				
Group	-1.60	0.03	-2.99	-0.21
Condition	0.88	0.27	-0.72	2.48
Group*Condition	-1.58	0.17	-3.85	0.69
Concern$_4$				
Group	1.22	0.03	0.16	2.28
Condition	-0.80	0.19	-2.03	0.42
Group*Condition	-0.31	0.72	-2.04	1.43
Comprehensibility$_5$				
Group	-1.91	<0.01	-3.17	-0.65
Condition	0.28	0.70	-1.17	1.73
Group*Condition	-0.18	0.86	-2.24	1.88
Time line$_6$				
Group	-0.56	0.43	-1.99	0.86
Condition	1.70	0.04	0.06	3.35
Group*Condition	-1.35	0.25	-3.68	0.99
HIQ hypomanic appraisals$_7$				
Group	0.36	0.21	-0.21	0.92
Condition	-0.24	0.46	-0.89	0.41
Group*Condition	-0.08	0.86	-1.01	0.84
HIQ normalising appraisals$_8$				
Group	-0.06	0.81	-0.59	0.46
Condition	-0.30	0.33	-0.90	0.31
Group*Condition	-0.12	0.79	-0.98	0.74
IDQ depressive appraisals$_9$				
Group	0.62	0.01	0.19	1.06
Condition	-0.03	0.91	-0.53	0.47
Group*Condition	-0.17	0.64	-0.88	0.54
IDQ normalising appraisals$_{10}$				
Group	0.22	0.52	-0.45	0.88
Condition	0.01	0.97	-0.75	0.78
Group*Condition	-0.31	0.57	-1.40	0.78

$_1R^2$=0.20; $_2R^2$=0.24; $_3R^2$=0.25; $_4R^2$=0.18; $_5R^2$=0.23; $_6R^2$=0.13; $_7R^2$=0.06; $_8R^2$=0.05; $_9R^2$=0.17; $_{10}R^2$=0.01

4.4.3.3 Stage 3: Intention

4.4.3.3.1 Overview of analysis

The pattern of participants' intention to make their mood go up, down or stay the same was initially examined by comparing the pattern of responses from control versus bipolar participants in Tables 58 (negative condition) and 59 (positive condition). The Mantel-Haenszel Common Odds Ratio Estimate (MHCORE) was then used to test whether the relationship between baseline mood and intention was the same in the control group as it was in the bipolar group. MHCORE was used (rather than e.g. a straightforward chi-squared test) because, rather than just testing whether there is an association between mood and intention, MHCORE tests whether the association is the same in the two groups (control and bipolar).

Current mood was calculated by finding the lower and upper quartiles of post-MI VAS scores. Low mood was defined as scores of ≤ -15 (lower quartile threshold), medium mood was defined as scores of ≥ -14 and ≤ 11 and high mood was defined as scores of ≥ 12 (upper quartile threshold).

4.4.3.3.2 Results: Negative condition

The MHCORE showed no significant association between group and intention following negative MI (MHCORE=0.26 (0.04-1.82), p=0.35) and the pattern of data Table 60 was in line with the non-significant p-value. Generally, both groups intended to make their mood go up (control=74%, bipolar=76%) rather than stay the same (control=26%, bipolar=24%) or go down. Only one bipolar participant intended to make their mood go down following negative MI. This participant was excluded from analysis because the data could not be modelled in a meaningful way.

Table 58: Current Mood-by-Intention-by-Group for Negative Condition

Group	Current mood	Intention		Total
		Same	Up	
Control	Low	0	5	5
	Medium	5	9	14
	Total	5	14	19
Bipolar	Low	2	8	10
	Medium	2	5	7
	Total	4	13	17
Total	Low	2	13	15
	Medium	7	14	21
	Total	9	27	36

4.4.3.3.3 Results: Positive condition

The MHCORE showed no significant association between group and intention following positive MI (p=0.26). The common odds ratio could not be estimated because no participants in the control group had the intention to go up (see Table 59). However, there seems to be a discrepancy between the non-significant p-value and the pattern of data in the Table 61, most likely due to a modest sample size. Table 59 shows that following positive MI none of the control participants intended to make their mood go up and 100% intended to make their mood stay the same. However, in the bipolar group 55% intended to make their mood go up and 45% intended to make their mood stay the same. No participants intended to make their mood go down following positive mood induction. This discrepancy will be discussed.

Table 59: Current Mood-by-Intention-by-Group for Positive Condition

Group	Current mood	Intention		Total
		Same	Up	
Control	Medium	4	0	4
	High	7	0	7
	Total	11	0	11
Bipolar	Medium	0	3	3
	High	5	3	8
	Total	5	6	11
Total	Medium	4	3	7
	High	12	3	15
	Total	16	6	22

4.4.3.4 Stage 4a: Selection

Participants' numerical responses to the 2 items from each theme within the RSQ and RPA were averaged to give a total score on each type of CS for each participant. MLR was then performed to predict selection of CS (according to the six CS types) based on group, condition and a group-by-condition interaction. Note that the reference category for group was control, for condition was negative and for intention was stay-the-same. The single participant who had intention to go down was excluded from analyses because with only 1 participant the effect of intention=down and corresponding standard error could not be estimated.

Table 60: Mean Selection Scores per MI Condition

Strategy type*	Control-Neg (n=19)	Control-Pos (n=11)	Bipolar-Neg (n=18)	Bipolar-Pos (n=18)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Neg rumination	1.13 (0.33)	1.14 (0.45)	1.86 (1.08)	1.55 (0.76)
Adaptive	3.08 (0.67)	2.09 (0.83)	2.36 (0.82)	2.50 (0.55)
Dangerous	1.21 (0.35)	1.00 (<0.01)	1.17 (0.42)	1.23 (0.41)
Em focus pos rum	2.45 (0.66)	2.27 (0.90)	2.28 (0.94)	2.46 (0.57)
Dampening	1.29 (0.42)	1.59 (0.83)	2.03 (0.83)	1.82 (0.68)
Self focus pos rum	2.16 (0.65)	1.59 (0.66)	2.06 (0.87)	2.00 (0.63

*Scale: 1 (not at all likely) to 4 (very likely)

Table 61 displays the results for each coping strategy theme tested. The statistically significant findings were as follows:

- *Negative rumination:* Bipolar participants selected significantly more negative ruminating CS than controls.
- *Adaptive:* Controls selected significantly more adaptive CS than bipolar participants, participants in the negative condition selected significantly more adaptive CS than participants in the positive condition and control participants in the negative condition selected significantly more adaptive CS than any other group-by-condition combination.

- *Dampening:* Bipolar participants selected significantly more dampening CS than controls.
- *Self-focussed positive rumination*: Participants in the negative condition selected significantly more positive self-focussed CS than participants in the positive condition.

Table 61: Selection Results

Model	B value	p-value	95% CI lower	95% CI upper
Negative rumination$_1$				
Group	0.73	<0.01	0.25	1.21
Condition	0.01	0.99	-0.55	0.56
Group*Condition	-0.32	0.42	-1.11	0.47
Adaptive$_2$				
Group	-0.72	<0.01	-1.20	-0.24
Condition	-0.99	<0.01	-1.54	-0.43
Group*Condition	1.13	0.01	0.34	1.92
Dangerous$_3$				
Group	-0.04	0.71	-0.28	0.19
Condition	-0.21	0.12	-0.48	0.06
Group*Condition	0.27	0.16	-0.11	0.65
Emotion-focussed$_4$				
Group	-0.17	0.52	-0.69	0.35
Condition	-0.18	0.56	-0.78	0.43
Group*Condition	0.35	0.41	-0.50	1.21
Dampening$_5$				
Group	0.74	<0.01	0.22	1.20
Condition	0.30	0.26	-0.23	0.83
Group*Condition	-0.51	0.18	-1.26	0.24
Self-focussed$_6$				
Group	-0.10	0.67	-0.58	0.38
Condition	-0.57	0.04	-1.12	-0.12
Group*Condition	0.51	0.20	-0.27	1.29

$_1R^2$=0.16; $_2R^2$=0.22; $_3R^2$=0.05; $_4R^2$=0.01; $_5R^2$=0.17; $_6R^2$=0.08

4.5 Discussion

4.5.1 Summary of main findings

Mood management was examined within the mood management model framework following an induced change in mood using a MIP. Contrary to predictions there were no significant group differences in time taken to detect a mood change. However, following the detection of a mood change, people with BD interpreted significantly less personal control over mood, less comprehensibility regarding mood, more concern about mood and made more self-dispositional depressive appraisals regarding the cause of current mood (regardless of MI condition) compared to controls. Contrary to predictions, there were no statistically significant group differences in intention to modify mood. However, patterns of intention suggested that people with BD were more likely than controls to intend to make mood go up when current mood was already high. At the selection stage, regardless of MI condition, people with BD selected significantly more CS associated with negative rumination and dampening of positive emotion (both of which are likely to exacerbate symptoms of depression), while controls selected significantly more adaptive CS than people with BD, particularly in the negative MI condition.

4.5.2 The MIP

The MIP was successful at eliciting a mood change in 60% of the control and 58% of the bipolar sample and was also successful at eliciting a mood change that continued while participants answered questions related to mood management. MI success in the bipolar sample was not related to differences in socio-demographic or clinical variables or to pre-MI mood state (p-values were all >0.05 for comparisons between eligible and ineligible samples). In the control group, MI success was not related to pre-MI mood state or to the majority of socio-demographic variables. However, MI was significantly less successful for older participants in the control sample. MI success may be associated with individual

differences in emotional sensitivity to the specific music pieces and film clips used. Some people may have emotion laden memories associated with the MI materials that were activated during the MIP causing a stronger shift in mood for these people. These associations may be stronger in younger control participants or younger control participants may be more sensitive to mood change. The reason that age may not have affected sensitivity to the MIP in the BD sample may be that this group, by definition, were more sensitive to fluctuations in mood.

4.5.3 The stages of mood management

Differences in how people with and without BD manage mood following an induced change in mood were identified using the mood management model framework proposed in the current research (Figure 13). Significant differences were found between people with and without BD in how mood was interpreted (stage 2) and in the strategies selected to manage mood (stage 4a) following an induced mood change. Findings are discussed below in relation to the stages of mood management examined.

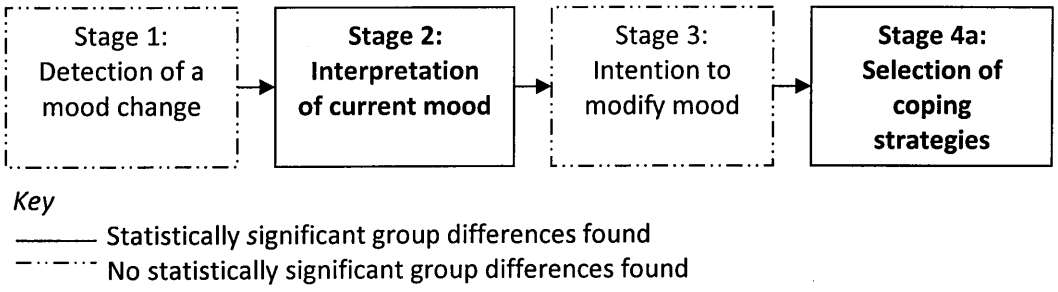


Figure 13: Group difference in mood management (MI)

4.5.3.1 Stage 1: Detection

Contrary to predictions, there were no significant differences between people with and without BD in time taken to detect a mood change. Despite a lack of statistically significant results, the trend appeared to be that bipolar participants were faster than controls at detecting a mood change in both positive and negative MI condition, suggesting a

hyper-vigilance to mood change in BD. A reason for the non-significant result may have been the modest sample size. With a larger sample the trend in time-to-detection may have been supported by a statistically significant result. On the other hand, mean time to detection only varied between groups by a less than 2 minutes maximum therefore the results found may reflect a genuine non-significant effect. These possibilities warrant further testing with a larger sample.

4.5.3.2 Stage 2: Interpretation

In line with current predictions, people with BD interpreted significantly less personal control over mood, less comprehensibility regarding mood, more concern about mood and made more self-dispositional depressive appraisals regarding the cause of current mood following an induced change in mood (regardless of valance) compared to controls. Each dimension along which people interpret their mood related experiences will now be discussed in turn.

4.5.3.2.1 Consequences

A limitation of the BIPQ is that it does not distinguish between positive and negative consequences despite emerging literature regarding positives in BD (Galvez et al., 2010; Lobban et al., 2012; Seal et al., 2008). The current study assessed interpretations of both the positive and negative consequences following a mood change. As would be expected, both groups perceived significantly more positive consequences following positive MI compared to negative MI. Interestingly, participants perceived a significantly greater magnitude in consequences following positive MI compared to negative MI. This result was surprising given the undesirable symptoms associated with low mood. Bipolar participants may have perceived more consequences associated with elevated rather lowered mood due to past experience of an upward shift in mood escalating into mania. Seventy six percent of the

bipolar sample had a diagnosis of BD I, over half had experienced psychosis and over half had experienced hospitalisation. Thus, an upward shift in mood may have signalled an impending manic episode for these people. Even more surprising was that the control participants in the positive condition perceived a significantly greater magnitude in consequences than any other group-by-condition combination. This result suggests that, for controls, the consequences associated with positive affect (e.g. positive mood, increased socialising, getting things done) may be greater than those associated with low mood (e.g. decreased appetite, lack of energy and lack of interest).

4.5.3.2.2 Personal control

In line with predictions and previous research (Lobban et al., 2013), people with BD interpreted significantly less personal control over their mood than controls following MI (regardless of condition). Previous research (Crowe et al., 2012) and a number of theories view control as integral to the understanding of psychopathology (e.g. PCT; Powers, 1973) and specifically BD (ICM; Mansell et al., 2007). Given that people with BD experience extreme changes in mood that they are unable to curtail by their own efforts, it seems unsurprising that they perceived a lack of personal control over their emotions.

4.5.3.2.3 Concern

In line with previous findings (Lobban et al., 2013), people with BD were more concerned about their mood following MI (regardless of condition). Given that people with BD feel less control over their mood, a lack of a coherent understanding of their mood (see below) and by definition experience extreme mood changes this result was not surprising. Although it may have been expected that increased concern in BD would be related to increased perceptions of negative consequences related to a change in mood, the current results did not support this.

4.5.3.2.4 Comprehensibility

In line with predictions and studies of illness comprehension in other mental health disorders (e.g. Godoy-Izquierdo et al., 2007; Higbed & Fox, 2010), people with BD found their moods significantly more difficult to understand than controls following MI (regardless of condition). These findings suggest that people with BD lack a coherent model regarding mood and mood changes despite the development of formulations often being a significant part of clinical intervention.

4.5.3.2.5 Time line

Contrary to predictions, there were no significant group differences in interpretations of the duration of a mood change. However, both groups interpreted a significantly longer duration of mood following positive MI compared to negative MI. With regard to the bipolar sample, this finding is in line with previous research that found that people with BD, and those vulnerable to BD, reported sustained elevations in positive affect following positive MI compared to controls (Farmer et al., 2006). A reason why controls also interpreted a longer time line following positive MI may have been that the MIP used only elicited minor increases in positive affect which were still within normal range. The fact that positive affect was harder to induce in the current study than negative affect suggests that normal mood for healthy controls is slightly elevated. Thus, control participants were interpreting a longer duration of normal mood rather than high mood. The same could also be true for the BD sample in this study.

4.5.3.2.6 Cause

In line with previous findings (Jones & Day, 2008) participants with BD reported significantly more self-dispositional depressive appraisals than controls, suggesting that they attribute the cause of negative mood to internal characteristics. Such appraisals are likely to

increases symptoms of depression and feelings of low personal control over mood which may increase risk of relapse.

Previous research has also reported higher *positive* self-dispositional appraisal style by BD participants compared to controls (Jones et al., 2006a). The reason these results were not replicated in the current research may have been because the MIP only produced minor increases in mood that were not sufficient to activate positive self-dispositional appraisal styles. Another reason may have been the use of only one item to assess positive self-dispositional appraisals. Using a single item may not have captured differences in positive self-dispositional appraisal styles as the 10-item HIQ would. A further explanation of the non-significant result may be that the modest sample size did not allow for the detection of small differences between groups in positive self-dispositional appraisals. These possibilities warrant further testing in future research.

4.5.3.3 Stage 3: Intention

Following negative MI both groups intended to make mood go up and patterns of intentions supported the lack of statistically significant group differences. This finding was in line with predictions based on the negative aspects of low mood. Interestingly, 1 participant with BD intended to go down following negative MI. On experiencing negative affect an intention to further decrease mood could explain why people with BD experience periods of depression. Investigation of intention to decrease mood following negative MI should be conducted with a larger sample.

Statistically there were no significant group differences in intention following positive MI. However, patterns of intentions conflicted with this result. While the entire control sample intended to stay the same following an upward change in mood, only 45% of the BD sample had this intention and the remaining 55% intended to make their mood go up. This pattern of results was in line with research that suggests people with BD strive for a

mild hypomanic mood state (Lam et al., 2004; Lam et al., 2005; Lee et al., 2010; Wright et al., 2005) even after an upward change in mood (Wright et al., 2005). The reason why no significant group differences were found (despite an obvious divergence in patterns of intentions between groups) was likely to be the modest sample size which did not allow for enough power to detect small effects. Future research should test whether statistically significant group differences in intention to modify mood, indicated by the patterns found in the current study, are found with a larger sample.

4.5.3.4 Stage 4a: Selection

In line with current predications, people with BD selected significantly more coping strategies associated with negative rumination and dampening of positive emotion compared to controls (regardless of MI condition), while controls selected significantly more adaptive coping strategies compared to people with BD, especially in the negative MI condition.

A growing body of literature reports negative rumination response styles in BD (Alloy et al., 2009; Bentall et al., 2011; Johnson et al., 2008b; Knowles et al., 2005; Thomas & Bentall, 2002; Thomas et al., 2007; Van der Gucht et al., 2009). Negative rumination is associated with increased depression and low mood (e.g. Knowles et al., 2005; Pavlickova et al., 2013) and so heightened negative rumination in BD may explain why following a downward change in mood people with BD may spiral into a depressive episode. Participants with BD also reported significantly more dampening strategies than controls. However, there were no significant differences between BD and controls in the use of positive rumination (both groups selected more self-focused positive rumination following negative compared to positive MI). These results are in contrast to a number of studies that have found higher reports of positive rumination, but not dampening, in people at risk for BD and with BD compared to controls (Johnson et al., 2008b; Raes et al., 2009). However, these studies did

not use people with BD I and therefore may have underestimated the use of dampening. Only BD I suffer functional impairment due to elevated mood and so are likely to be motivated to decrease positive affect to avoid an episode of mania. In the current study, 76% of the BD sample had BD I. The current results are in line with previous research specifically using a sample of BD I compared to controls (Edge et al., 2013). Future research should aim to test the RPA using participants on the spectrum of BD (at-risk, BD II and BD I).

Rumination on negative emotions and dampen positive emotion in response to a change in mood can explain how the coping strategies selected by people with BD exacerbate symptoms of depression and ultimately lead to a depressive episode. Interestingly, people with BD scored higher for both negative rumination (selection stage) and self-dispositional depressive appraisals (interpretation stage) than controls, thus indicating a tendency for people with BD to exhibit cognitive styles involving self-focus rather than focus outward. Focussing attention inwards in response to depressive symptoms may exacerbate such symptoms and explain why, on experiencing a slight downward mood change, people with BD may go on to experience a full blown episode of depression.

Previous research has found that bipolar participants in a manic phase reported engaging in more dangerous activities than depressed/euthymic bipolar participants and controls (Thomas et al., 2007; Van der Gucht et al., 2009). However this study did not include anyone with significant hypomanic/manic symptoms and so the fact that there were no group differences in dangerous activities may be unsurprising. Unlike negative rumination which remains elevated when people with BD are in remission, use of dangerous activities may only be more prevalent in BD when in a manic phase. Rather than leading to mood elevation in BD, selection of dangerous activities may reflect behaviours associated with mania and may exacerbate symptoms once they are manifested.

Finally, at the selection stage, control participants reported significantly more adaptive strategies than BD, as predicted. Such strategies are likely to promote mood

stability and draw attention away from negative emotions. Therefore, it was not surprising that both groups selected more adaptive CS in the negative compared to positive MI condition and that control participants in the negative condition selected more adaptive CS than any other group-by-condition interaction.

4.5.4 Implications for treatment

It should be acknowledged that this research was unable to establish any causal patterns to the processes involved in mood management due to a cross-sectional design. Thus, prospective research is required to test the causal relationship between mood management processes in BD and risk of relapse before the true impact of the following implications is revealed.

The current results suggest that the way in which people with BD interpret minor changes in mood may increase risk of relapse and should therefore be a focus for interventions in BD. Specifically, interpretations regarding personal control, comprehensibility, concern and internal attributions of depressive experiences may impact on outcome in BD. Although NICE (2006) guidelines suggest that everyone with BD should receive some form of psychological therapy, this is not the case for all individuals. Indeed, medication is often the only form of treatment. This level of treatment could still be provided within a framework of how the interpretations highlighted here may impact on mood. For example, to increase a sense of personal control in BD, medication could be administered through a collaborative approach which promotes self-management techniques by increasing a sense of control and choice regarding adherence to medication regimes. In order to increase comprehensibility regarding BD at this basic level of treatment (medication) a discussion should take place between practitioner and client regarding the medication(s) prescribed e.g. what they are, what they are for, possible side effects and any alternatives. For people with BD who do access psychological services, a formulation of what

is happening for an individual could be developed during therapy that makes sense to the individual and provides them with a working model to manage their mood.

Psychoeducation provides a structured way to promote self-management, increase control and educate people about their illness. Psychoeducation has been shown to be effective at reducing relapses in BD (Colom & Vieta, 2006; Colom et al., 2009). Interventions, such as CBT may also be advantageous in altering maladaptive appraisal styles in BD which attribute blame for negative mood to the self rather than external factors. Similarly, CBT could be used to promote effective coping in BD and explore the pros and cons related to negative rumination and dampening coping styles which may alleviate symptoms of hypomania by increase symptoms of depression. Adaptive coping strategies (as used by the control group in this study) could be promoted and may improve relapse rates in BD.

4.5.5 Limitations

The current findings should be interpreted within the confines of several limitations. Firstly, no formal power calculation was conducted and therefore statistical power may not have been sufficient to reject the null hypothesis for some stages (particularly detection, interpretation of hypomanic symptoms, intention following an upward shift in mood and selection of positive rumination strategies). A retrospective power calculation was not conducted because power calculations are helpful as a guide in *planning* studies rather than in interpreting results (once the study has been carried out, the results have already been obtained and should be interpreted accordingly). Furthermore, confidence intervals were reported which can be used to indicate the likely size of possible effects, even if results are not significant. Indeed, Hoenig and Heisey (2001) stated that "Once we have constructed a confidence interval, power calculations yield no additional insights" (page 4).

Secondly, due to constraints on the recruitment period, bipolar and control samples were not matched on demographics such as employment. While this means the sample was

more generalisable because BD samples experience more difficulties regarding employment (Judd et al., 2008), experimental comparisons may be confounded by such group differences. Further, participants with BD were not excluded based on comorbidities or medication status because this represented a more ecologically valid sample. Therefore, observed group differences could have been affected by these covariates. Additionally, people who volunteer for research studies using MIPs may not be representative of the general population from which they are drawn. Indeed, in the current control sample the number of female participants, participants in employment and married participants was higher in the current sample than would be expected within the general population. The mean age of BD onset in the current sample was higher than previously reported (e.g. Kogan et al., 2004; Oswald et al., 2007; Suppes et al., 2001) and the current bipolar sample may not represent the general population of people with BD with regards to clinical history (e.g. those with a recent diagnosis or first time episode) but may represent a more chronically unwell sample of people with BD. Thus, observed group differences could have been affected by these issues and so further research is needed to identify the impact of these potential confounds on the group differences observed.

Finally, a number of limitations relate to the study design. This study was cross-sectional in nature and therefore it is important to test causality through prospective intervention studies to examine whether changing any of the variables associated with the mood management stages impacts on relapse in BD.

Although explicit MIPs have been found to be highly effective and less ethically dubious than implicit MIPs (Martin, 1990; Westermann et al., 1996), they are open to demand characteristics. Further, including a second film clip for participants whose mood did not change after the initial 2 clips may have increased the likelihood of demand effects in the current study. If participants pretend to be in the desired mood state because they are either informed of, or guess, the purpose of the study and want to comply with experimental

demands this could pose a problem for the validity of the MIP. However, there is little empirical evidence that participants want to guess and confirm research hypotheses (see Berkowitz & Troccoli, 1986; Cook & Campbell, 1979) and participants were naive to the hypotheses being tested in this study. Further, the ethical considerations associated with informed consent to induce a mood change in a population with a diagnosed mood disorder outweighed the possibility of demand characteristics.

Another limitation regarding the study design related to the anchors on the VAS. The original anchors included in a pilot study were based on studies by Mansell and Lam (2006) and Wright et al. (2005) and were labelled 'extremely sad' at one end and 'extremely happy' at the other. However, controls scored unexpectedly high for 'happy' and therefore 'high and manic' were included to provide extra definition of what was meant by 'extremely happy'. It should be noted that being happy and manic are not the same emotional states and changing the anchors in this way could have reduced scores at the more extreme ends of the scales. Better anchors could be used in future studies that allow distinction between happy and manic mood state while also emphasising the upper ends of the scales. An additional limitation regarding the VAS was that where a participant specifically moved from and to on the VAS was not considered. Therefore a participant could have moved from -20 to -10 in the positive MI condition and still have been included in analyses due to successfully moving at least 8 points on the correct direction despite still having negative mood. However, post-MI VAS scores revealed no high mood scores (all ≤12) in the negative condition and no low mood scores (all ≥15) in the positive condition.

Finally, regarding the study design, it should be noted that due to the limited time MI is suggested to last (e.g. Frost & Green, 1982), measures were not open-ended and therefore may not have captured all possible mood management strategies utilised by participants. Although only forced options were given it was the participants' decision regarding to which option to respond positively, rather than a code attributed by the researcher for an open

question. It is also important to note that the BIPQ, HIQ, IDQ, RSQ and RPA were all adapted for the current research to ask about state (current mood) rather than trait phenomena. These measures have not been validated as state measures but were used due to lack of availability of state measures.

4.5.6 Future directions

Replicating results following a formal power calculation is important. Using a larger sample, future research could examine the influence of treatment, medication and comorbidities in BD on mood management processes. Future research should also aim to match groups in socio-demographic data, and could include a unipolar depressed control group matched on symptomatology to allow examination of mood management processes specific to BD.

For ethical reasons, this study only included euthymic BD participants and focused on mood management for emotions induced in a controlled way. With particular attention to ethical considerations, future studies could examine whether findings are generalisable to the mood management of more extreme mood symptoms to improve knowledge on mood management following the onset of a mood episode. Specifically, using a within-person design future research could explore differences in mood management when people with BD are entering an episode of BD and when they are not going into episode to understand how processes differ depending on mood state.

A number of final suggestions for future research relate to the current study design. This study was cross-sectional and so cannot provide comment on how mood management strategies predict relapse in the long term. Longitudinal studies are needed to test causal relationship between mood management processes in BD (e.g. interpretations and coping) and risk of relapse. Further, in the current study randomisation was conducted in R statistical software by the first author and therefore was not independent. Future studies should use

an independent randomisation procedure. The validity of the measures used in this study should also be tested in future research.

4.6 Conclusions

Despite the limitations discussed, this study provides an important step towards highlighting specific stages at which people with and without BD differ in mood management following an induced change in mood. Specifically, people with BD interpreted less personal control, less comprehensibility, more concern and used more self-dispositional depressive appraisal styles than controls. In an attempt to manage mood people with BD used more negative rumination and dampening coping styles while controls used more adaptive strategies. Future research following a formal power calculation is needed to confirm the effects found and test whether the differences found play a causal role in the escalation of mood into relapse.

CHAPTER 5: STUDY 3

Early warning signs and coping strategies for bipolar disorder

5.1 Abstract

Based on the SRM (Leventhal et al., 1984) 5 stages of mood management were identified. The current study aimed to build on the existing literature to examine the detection, implementation and evaluation stages of the mood management model in more detail.

Baseline data on 2 self-report measures of early warning sign detection and 2 measures of coping was collected from 264 participants recruited into the PARADES randomised controlled trial across 11 sites in the North West of England and Nottingham.

People with BD were able to identify common EWS of depression (low energy, low motivation, feeling tired, loss of interest in activities, feeling anxious and worrying a lot) and mania (being more talkative, trouble getting to sleep, feeling more energetic and feeling emotionally high) and generally employed helpful CS to deal with low mood (medication use, help seeking and relaxing). The most commonly used CS for mania were related to stimulating behaviours (enjoying the high, continuing with several activities, following instincts and acting accordingly and becoming irritable and ignoring what others said) that would likely escalate mood and were therefore contrary to mood management. When participants themselves were asked to evaluate the CS used the most to cope with depression, the majority were rated as helpful while the strategies used the most to cope with mania were all rated as unhelpful.

Thus, what may be most important for therapy is helping people with BD weigh up the pros and cons of going with the high mood and teaching them strategies that may work to moderate elevated mood while giving them control over what they choose to do.

5.2 Introduction

Recognition of early warning signs (stage 1: detection), employment of coping strategies (stage 4b: implementation) and evaluation of the coping strategies employed (stage 5a: evaluation) are important stages within the mood management model proposed in the current research and therefore deserved additional attention. Akin to interventions based on EWS recognition, the model management model proposed (Figure 14) would hypothesise that successful mood management depends on one's ability to detect EWS and initiate CS that have been evaluated as effective for reducing the risk of relapse (see Morriss et al., 2007 for a review).

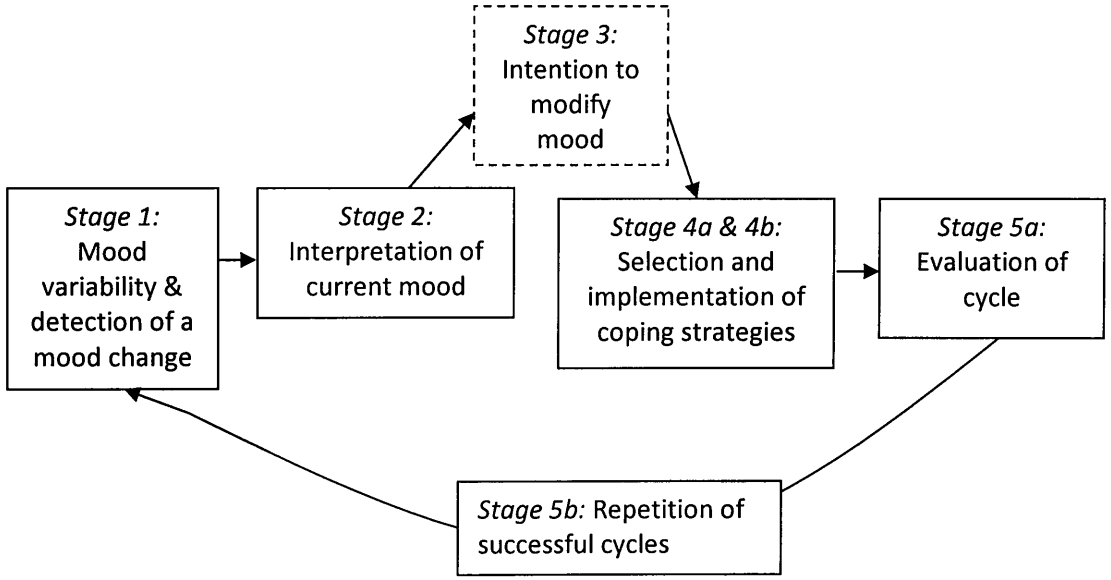


Figure 14: The mood management model

Medication alone cannot protect all people with bipolar disorder (BD) from relapse. Joyce (1985) highlighted that, in addition to medication adherence, an ability to recognise EWS and employ CS in response were important factors in the management of BD. A number of randomised controlled trials (RCTs) have shown that psychological interventions that teach people with BD to recognise EWS and employ effective CS are successful in reducing

relapses (Colom et al., 2003; Lam et al., 2003; Lobban et al., 2010; Perry et al., 1999). Therefore promoting effective recognition of EWS and employment of effective CS is likely to be pivotal to developing effective treatment for people with BD.

The current study aimed to build on the existing literature to examine the detection (recognition of EWS), implementation (coping) and evaluation (perceived helpfulness of CS) stages of the mood management model in more detail. Most studies of EWS in BD have focussed on prodromal symptoms that could occur at any time leading up to a full blown episode. However, interventions based on recognition of EWS rely on symptoms being recognised early enough in the prodromal phase for effective CS to be employed to prevent symptom escalation. Lobban et al. (2011) developed measures to assess recognition of EWS in depression and mania for people with BD. These measures assess the frequency of EWS monitoring, the common EWS reported by people with BD and the stages in relapse at which signs are recognised (early, late, or full relapse). These measures have shown reliability over time and evidence of construct validity. However, the sample size used previously (Lobban et al., 2011) was modest (n=96) therefore exploration of EWS in a larger sample was needed. Further, previous studies of coping in BD have generally used small samples of 32-40 participants (Lam et al., 2001; Lam & Wong 1997) or have employed a measure of coping (The CPIM) which has shown poor reliability for some subscales. Therefore this study aimed to examine the common CS reported by people with BD in a larger sample with an alternative measure (the Coping Strategies Questionnaire; Lobban et al., 2007) and elaborate on previous research by distinguishing between the types of CS used consistently and those used intermittently by people with BD. Additionally, only one study (Depp et al., 2009) has asked the participants with BD directly about perceived helpfulness of CS used and this study did not include an important distinction between CS for mania and depression. Therefore it was important to ask participants directly about perceived helpfulness of CS used for

depression and mania separately to establish the types of CS that may be helpful for preventing relapse into each episode type.

In addition to elaborating on existing research, the current study aimed to replicate results from previous research which has found a positive association between recognition of EWS for depression and mania (Lam et al., 2001; Perich et al., 2013) and use of CS for depression and mania (Lam & Wong, 1997). Further, the current study aimed to explore whether there was an association between the types of EWS detected and CS used.

The literature regarding BD was reviewed in relation to each stage of the mood management model framework in Section 1.5 and so will not be repeated here. The specific pages of reference for the literature pertaining to each stage are listed below.

Stage 1-Detection: Section 1.5.1.3, page 80

Stage 4b-Implementation: Section 1.5.4.2, page 101

Stage 5a-Evaluation: Section 1.5.5.2, page 105

5.2.1 Study aims

Based on the gaps in the previous research into recognition of EWS and coping in BD, the current study had a number of aims presented in Table 62.

Table 62: Study 3 Aims

Aim	Hypotheses
1	a) To replicate previous findings of a positive association between the number of EWS recognised for depression and mania. b) To replicate previous findings of a positive association between the frequency of coping strategy use (sometimes, often or all the time) for depression and mania.
2	To examine whether there is a relationship between the types of EWS identified and the types of CS employed, and if so, what type of early warning sign recognition predict coping strategy use. Types of EWS/CS reported (e.g. cognitive, behavioural, physical etc.) will be identified through separate principal components analyses (PCA) for EWS and CS. Any interpretable components that emerge from the PCA will then be used in a regression with CS as the dependent variable and EWS as the independent variable.
3	a) To identify whether there are common EWS recognised *early* in relapse. b) To examine whether there is a temporal pattern to symptom recognition during the onset of an episode.

4 To identify whether there are common CS used to manage mood; and b) to distinguish between consistent and intermittent use of CS for depression and mania.

5 To examine whether the CS reported to be used the most for depression and mania are also perceived to be the most helpful for preventing relapse into the related episode type.

5.3 Method

5.3.1 Design

This study had a cross-sectional, within-participant design. Data were collected through the PARADES Psychoeducation RCT (see Morriss et al., 2011 for PARADES protocol and Section 2.3 for details of data collection). Initially data from the EWS and CS questionnaires were explored for correlations between EWS and CS. PCAs were then performed on the EWS and CS questionnaires with the aim of extracting themes relating to the types of EWS and CS people with BD report. Following the PCAs, descriptive analyses were conducted on all measures.

Please note that I have been employed as a full-time Research Assistant (RA) on the PARADES Psychoeducation RCT based in Manchester since 2009 and have collected, inputted and checked (along with RAs at the 10 other sites involved in the trial) the data used in the current research. This data was readily available and relevant for the assessment of mood management in bipolar disorder (BD).

5.3.2 Participants

5.3.2 1 Sample Size

A power calculation was not conducted during study design because the sample size was predetermined by the number of participants (n=264) who had completed baseline data for the PARADES RCT at the time of current analysis. Although a power calculation was not conducted, the sample size was sufficient to perform correlation analysis (Schonbrodt & Perugini, 2013). However, recommendations regarding the sample size adequate for

conducting a PCA vary. Comrey and Lee (1992) suggested a scale for acceptable minimum sample size, where 100=poor, 200=fair, 300=good, 500=very good and 1000+=excellent. Others have suggested a ratio of 5 to 10 participants per variable (Kass & Tinsley, 1979). However Rouquette and Falissard (2011) concluded that measures with fewer variables did not require smaller sample sizes and suggested a minimum of 300 participants as a rule of thumb. The current study had access to data from 264 participants for each measure. According to Rouquette and Falissard (2011) this sample size was slightly small. However, based on the advice of Comrey and Lee (1992) this sample size was fair to good and using the ratio rule (Kass & Tinsley, 1979), both measures had enough participants per variable (between 6 and 8 participants per variable on each measure).

5.3.2.2 Recruitment

Baseline data available from 264 participants recruited to the PARADES Psychoeducation RCT were used in this study. No additional participants were recruited. The whole PARADES cohort was included, which consisted of participants allocated to the psychoeducation and peer support groups across 11 sites in the North West of England and Nottingham.

5.3.2.3 PARADES inclusion and exclusion criteria

The PARADES inclusion and exclusion criteria are presented in Table 63.

Table 63: PARADES Inclusion and Exclusion Criteria

PARADES inclusion criteria	PARADES exclusion criteria
• A primary diagnosis of BD I or II verified by the Structured Clinical Interview for DSM-IV (SCID; First et al., 1997). • Increased risk of relapse (at least 1 episode in the last 24 months). • Aged 18 or over.	• A current (or within the last 4 weeks) bipolar episode. • Current suicide plans or high suicide intent. • Unable or unwilling to give written informed consent to the study. • Unable to communicate in written and oral English to a sufficient level to allow completion of the measures.

5.3.2.4 Sample description and representativeness of the general population

5.3.2.4.1 Socio-demographics

Table 64 displays socio-demographic data for the sample of people with BD used in the current study. The mean age of the sample in the current study was similar to that reported previously in large cohorts of people with BD. Employment status in the current sample represents what would be expected in the general population of people with BD. In the line previous reports there was little difference between the number of people with BD who were married/cohabiting or single in the current sample. The ethnicity of the current sample was representative of the general population of people with BD (see Chapter 3, Section 3.3.1.4.2 for details of references).

Table 64: Study 3 Socio-Demographics

Descriptive	Overall BD sample (n=264)
Gender, M/F	110/154
Age, mean (SD)	45.30 (11.26)
Ethnicity, n (%)	
British	245 (93%)
Other	17 (6%)
Missing	2 (1%)
Marital status, n (%)	
Single	87 (33%)
Married/Cohabiting	95 (36%)
Separated/Divorced/Widow	80 (30%)
Missing	2 (1%)
Living arrangements, n (%)	
Partner with/without others	103 (39%)
Alone	103 (39%)
Other	57 (22%)
Missing	1 (<1%)
Highest level of education, n (%)	
Primary	23 (9%)
Secondary	67 (25%)
Further	84 (32%)
Higher	90 (34%)
Employment status, n (%)	
Employed	70 (27%)
Unemployed	194 (74%)

5.3.2.4.2 Clinical data

Table 65 displays clinical data for the sample of people with BD used in the current study. The majority of the bipolar sample (95%) were taking some form of medication.

The higher proportion of BD I compared to BD II and the prevalence rates for additional axis I disorders in the current sample were expected. In line with previous findings, the majority of people with BD were expected to be taking some form of medication (see Chapter 3, Section 3.3.1.4.3 for details of references).

Although the numbers of relapses reported were comparable to those previously (Suppes et al., 2001) these participants had to present for outpatient treatment to be recruited and the participants in the current study had to be willing to participate in a 21 week programme of group psychoeducation or peer support. Therefore, these participants may not be entirely reflective of the general population of people with BD (e.g. those with a recent diagnosis or first time episode) but may represent a more chronically unwell sample of people with BD.

Table 65: Study 3 Clinical Descriptives

Descriptive	Overall BD sample (n=264)
BD type, I/II	214/50
Number of relapses, n (%)	
<7	34 (13%)
8-19	82 (31%)
>20	148 (56%)
Days since last episode, mean (SD)	
High episode	477.49 (1049.94)
Low episode	324.02 (903.76)
Additional anxiety disorder, n (%)	
None	126 (48%)
Current	100 (38%)
Past	37 (14%)
Additional alcohol/substance disorder, n (%)	
Alcohol abuse, current/past	14/86 (38%)
Alcohol dependence, current/past	9/54 (24%)
Substance abuse, current/past	3/30 (13%)
Substance dependence, current/past	2/21 (9%)

Additional eating disorder, n (%)	
None	225 (85%)
Current	15 (6%)
Past	24 (9%)
Additional current BPD*, yes	12 (5%)
Medication	
No medication	12 (5%)
Monotherapy	45 (17%)
Combination therapy	209 (79%)
Antidepressant	123
Lithium	79
Carbamazepine	13
Valproate	99
Lamotrogine	45
Benzodiazepines/Hypnotics	35
Antipsychotics	143
Meds for physical problems	103

*Borderline Personality Disorder

5.3.3 Measures

5.3.3.1 The Early Warning Signs (EWS) questionnaire (Lobban et al., 2011)

The EWS questionnaire is a measure of the frequency of monitoring for EWS, the types of symptoms detected as a sign of an impending episode and how early in mood escalation these signs are detected. A separate questionnaire has been developed to assess depressive (EWS-D) and hypomanic (EWS-M) EWS (full versions available on request). The EWS-D checklist contains 32 items and the EWS-M contains 31 and both have shown good reliability over time and evidence of construct validity (Lobban et al., 2011).

The first section of the questionnaire asks participants to list spontaneous, idiosyncratic EWS and to indicate how frequently (if at all) these signs are monitored for (never, occasionally, fairly regularly, very regularly). The second part of the measure is the EWS checklist in which participants are asked to indicate whether closed examples of depressive or hypomanic EWS are detected early, late, in full relapse or not at all (absent).

Only the frequency of monitoring item and the EWS checklist were analysed in this study because they were most relevant to the current hypotheses. Further, responses to the spontaneous list were sparse, therefore there were too little data for meaningful analysis.

- *Example of frequency of monitoring item:*

Do you ever monitor yourself to see if any of these signals are occurring, and if so, how regularly? (Please circle)

Never	Occasionally	Fairly regularly	Very regularly

- *Example from EWS-D checklist:*

...Please place a tick against any of the signs listed below that you recognise as warning signs for your mood going low, and indicate when they occur as follows:

Absent=I DO NOT experience this
Early=I DO experience this and it is one of the FIRST things I notice
Late=I DO experience this and it occurs LATER as my mood is becoming lower
Full relapse=I DO experience this but ONLY when I am having a full relapse

	Absent	Early	Late	Full relapse
Low in energy				

- *Scoring the frequency of monitoring item*

Each item was scored on a 4-point scale where 1=never, 2=occasionally, 3=fairly regularly and 4=very regularly.

- *Scoring the EWS checklist*

Each item was scored on a 4-point scale where absent=1, early=2, late=3 and full relapse=4. Where a participant had given two or more responses the earliest response was rated e.g. if the participant had responded with 'early' and 'late', 'early' would be rated. This was because early signs were likely to continue throughout relapse (Lobban et al., 2011).

5.3.3.2 The Coping Strategies (CS) questionnaire (Lobban et al., 2007)

The CS questionnaire was developed for use in an early relapse prevention trial for BD (Lobban et al., 2007) based on Lam and Wong's (1997) coping interview. The CS

questionnaire asks participants to respond to closed examples of coping strategies associated with either depression or hypomania, indicating whether the strategy is never, sometimes, often or always used and how helpful the strategy was perceived to be (from not helpful at all to very helpful). A separate questionnaire has been developed to assess CS for depression (CS-D) and CS for hypomania (CS-M), both contain 39 items (full versions available on request). No psychometrics have been conducted on the CS questionnaire to date. However, due to the lack of other reliable measures of coping in BD and the fact that the CS questionnaire had already been incorporated into the PARADES RCT, its use was deemed appropriate.

- *Example from CS questionnaire:*

...Please decide whether you have used each of the following strategies, and if so, how often, and then circle the number which best describes how often you have chosen to cope in that way.

	Never	Sometimes	Often	All the time	How helpful? (1-5)
Sought professional help	1	2	3	4	( )

- *Scoring the CS questionnaire*

Each item was scored using the numerical response given by the participant (see example above). Where a participant had given two or more responses to the frequency of coping strategy use item, the highest response was rated e.g. if the participant had responded with 'sometimes' and 'often', 'often' would have been rated. This is because 'all the time' supersedes the lower responses (sometimes, often).

5.3.4 Procedure

All measures were approved by Nottingham Research Ethics Committee as part of the PARADES Psychoeducation RCT. The methodology for data collection was already decided as part of the PARADES protocol (see Morriss et al., 2011). For details see Section 2.3.

Baseline data were collected from 264 participants across 11 sites in the North West of England and Nottingham using two measures of early warning sign detection (the EWS questionnaire for Depression and the EWS questionnaire for Hypomania; Lobban et al., 2011) and two measures of coping (the CS questionnaire for Depression and the CS questionnaire for Hypomania; Lobban et al., 2007). Data was input into SPSS (IBM, 2011) by RAs employed on the PARADES Psychoeducation RCT. All data input was checked by the RAs at a different site and errors were rectified.

As part of the EWS questionnaires, participants were asked to report how often they monitored for EWS, what EWS that they recognised and at what stage in relapse EWS were detected for both depression and mania (giving a total number of EWS recognised *early* in relapse and thus constituting EWS). As part of the CS questionnaire, participants were asked to report the frequency of coping strategy use for depression and mania. Correlations between the data collected in response to these items were explored to examine aim 1. A PCA was then conducted on the data regarding the EWS recognised *early* in relapse, and overall use of CS, to extract potential underlying constructs within the EWS and CS questionnaires with a view to comparing the relationship between the types of EWS recognised and the types of CS used (aim 2). To explore what types of EWS were recognised early and at later stages in relapse (aim 3), the data from the EWS checklists for depression and mania were examined separately. Similarly, to explore what types of CS were used consistently and the types used on a more intermittent basis (aim 4), the data from the CS questionnaire for depression and mania were examined separately. Finally, to evaluate how adaptive CS were perceived to be for managing mood (aim 5), participants were asked directly to rate how helpful the CS used most often were for managing high and low mood separately.

5.4 Results

5.4.1 A note on the frequency of monitoring for EWS

Table 66 displays information regarding the frequency of monitoring for EWS of depression and mania. Participants generally monitored for EWS of depression and mania occasionally and there were similar numbers of participants never monitoring for EWS of depression (*n*=56) and mania (*n*=52).

Table 66: Frequency of EWS Monitoring

Frequency	EWS-D (%)	EWS-M (%)
Never	56 (21%)	52 (20%)
Occasionally	81 (31%)	73 (28%)
Fairly regularly	60 (23%)	62 (24%)
Very regularly	46 (17%)	41 (16%)
Missing	21 (8%)	36 (14%)
Total (no. ppts)	264 (100%)	264 (100%)

5.4.2 Associations between EWS and CS

5.4.2.1 The association between the number of EWS recognised for depression and mania (aim 1a)

Prodromes of BD can appear at any time up until relapse, however, this study was initially interested in identifying only those symptoms recognised *early* and therefore constituting EWS. Table 67 displays the total number of absent, early, late, full relapse and missing responses given by all participants. The majority of EWS were recognised early, while some were recognised later in relapse or not at all. Lobban et al. (2011) obtained similar results using the same measures. Seventy nine percent of participants were able to report prodromes of depression and 69% for mania (X^2=32.70, p<0.00). Although there was 3% missing data, this figure was the same across episode types. The items endorsed as early most frequently are displayed in Tables 69 and 70.

Table 67: Temporal Recognition of EWS

Recognition	EWS-D total responses across all items (%)	EWS-M total responses across all items (%)
Early	3680 (44%)	3024 (37%)
Late	2023 (24%)	1591 (19%)
Full relapse	891 (11%)	1101 (13%)
Absent	1567 (19%)	2243 (27%)
Missing	287 (3%)	225 (3%)
Total (no. items*no. ppts)	8448 (100%)	8184 (100%)

To examine whether there was an association between the number of *early* warning signs recognised for depression and for mania (aim 1a), rather than just using the total count for *early* signs recognised, a new variable was created in SPSS for the total proportion of *early* warning signs recognised by each individual participant (sum of *early* responses/total number of times a participant could have responded 'early') to account for the different possible total scores on the EWS-D (n=32) and EWS-M (n=31) and missing data. There was a moderate, but significant, positive correlation (r=0.44, p<0.001) between recognition of early signs of depression and mania (Figure 15).

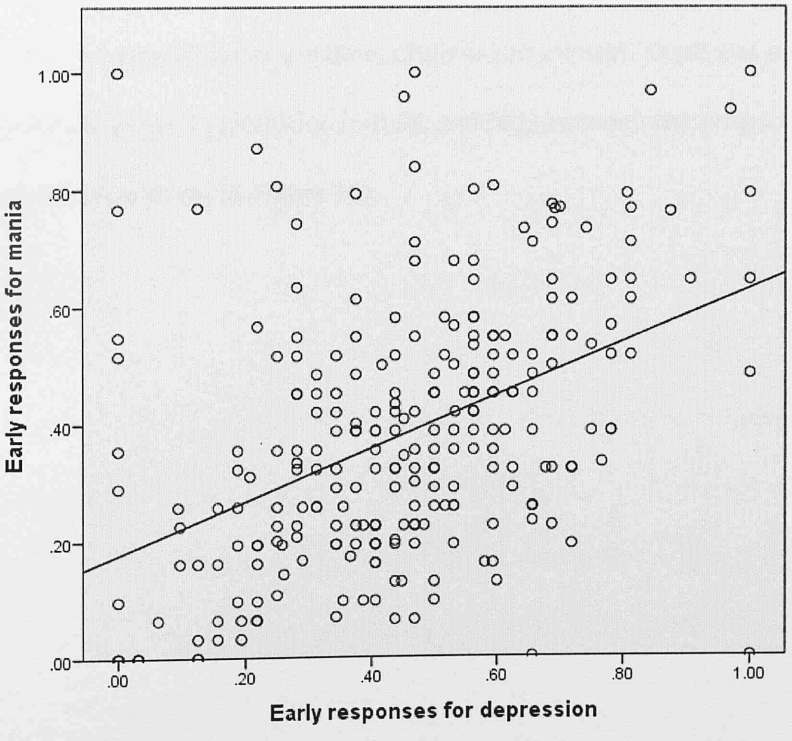


Figure 15: Consistency across EWS-D and EWS-M in early responses

5.4.2.2 The association between the frequency of coping strategy use for depression and mania (aim 1b)

Table 68 displays the total number of never, sometimes, often, all the time and missing responses given by all participants. The most common responses were never and sometimes. The items endorsed most frequently are displayed in Tables 74 and 75.

Table 68: Frequency of CS Use

Frequency	CS-D total responses across all items (%)	CS-M total responses across all items (%)
All the time	1111 (11%)	943 (9%)
Often	2099 (20%)	2078 (20%)
Sometimes	3242 (31%)	3362 (33%)
Never	3379 (33%)	3342 (32%)
Absent	465 (5%)	571 (5%)
Total (no. items*no. ppts)	10296 (100%)	10296 (100%)

To examine whether there was an association between the frequency of coping strategy use in response to depression and mania (aim 1b), a new variable was created in SPSS for the total proportion of coping strategies used by each individual participant (sum of scores for CS used all the time, often and sometimes/total number of times a participants could have responded all the time, often or sometimes). There was a moderate-high significant positive correlation ($r=0.59$, $p<0.001$) between the proportion of CS used for depression and mania (Figure 16).

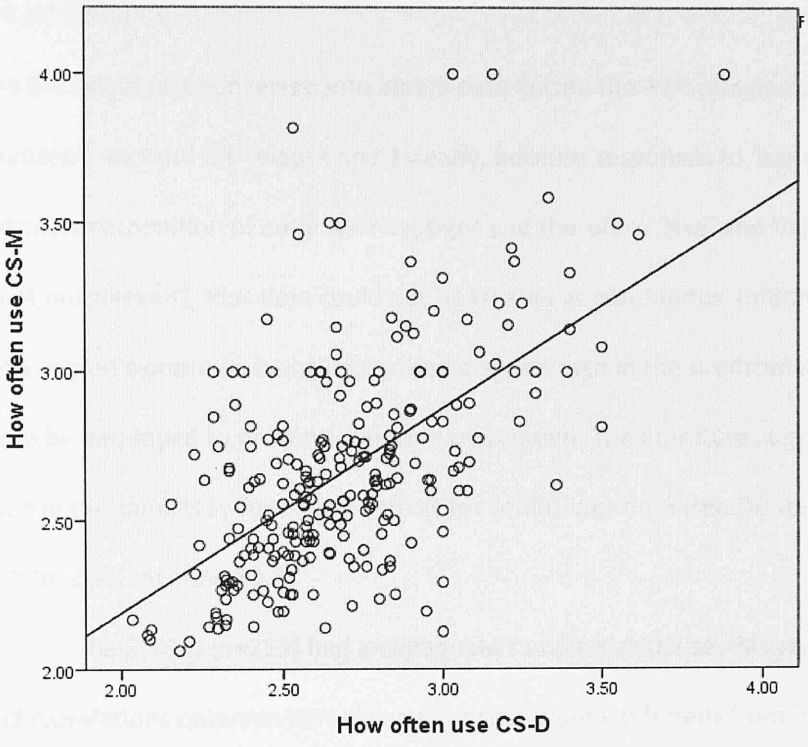


Figure 16: Consistency across CS-D and CS-M in frequency of CS use

5.4.3 The relationship between types of EWS and CS: PCA

PCAs were conducted to explore whether people with BD tend to recognise similar types of EWS and utilise similar types of CS (i.e. physical, behavioural, cognitive signs and strategies) and if so, what type of early warning sign recognition predicts coping strategy use (aim 2). If people with BD tend to behave in certain ways (that may be unhelpful for mood management) to particular EWS then an awareness by clinicians of such an association would be beneficial to the treatment of BD.

In order to extract themes within each measure, a PCA, with direct oblimin rotation was performed on the 32-item Early Warning Signs-Depression checklist (EWS-D), the-31 item Early Warning Signs-Hypomania checklist (EWS-M) and the 39-item Coping Strategies-Depression (CS-D) and Coping Strategies-Hypomania (CS-M) questionnaires separately. The item loadings and scree plots can be seen in Appendix 14 (EWS) and 15 (CS).

5.4.3.1 EWS PCA

The EWS data was converted into binary data before the PCA was performed, where 0=absent, late and full relapse and 1 =early, because responses to 'early' symptoms only indicates recognition of *early* warning signs and therefore 'late' and 'full relapse' responses were not relevant, thus data could not be treated as continuous. Interventions based on EWS rely on symptoms being recognised early enough in the prodromal phase for effective CS to be employed to prevent symptoms escalation. The literature suggests that PCA can be used in the same way for binary data as for continuous data (see Dunterman, 1989 p.88-79 & Jolliffe, 2002, Section 13.1).

The EWS-D (n=215) had an adequate sample size (Kaiser-Meyer-Olkin, KMO = 0.80) and correlations between items that were significantly different from 0 and therefore appropriate for inclusion in the PCA (Bartlett's test of sphericity x^2 (496) = 1957.83, p<0.001). Ten components had an eigenvalue over Kaiser's criterion of 1 and together these components explained 61.70% of the variance. However, component 1 explained around a third of this variance (20.95%), while the other 9 components explained less than 7% each. The top 5 ESW-D items that loaded most highly on component 1 were a mixture of signs, namely anxiety, worry, a loss of interest and motivation and ideas slowed.

The EWS-M (n=215) also had an adequate sample size (KMO=0.83) and correlations between items were sufficient for PCA (Bartlett's test of sphericity x^2 (465) = 1943.12, p<0.001). Nine components had an eigenvalue of greater than 1 and together they explained 60.42% of the variance. However, component 1 explained over a third of this variance (22.41%), while the other 8 components explained less than 8% each. The top 5 EWS-M items that loaded most highly on component 1 were related to disinhibition (including wanting to party all night and risk taking), racing thoughts and feeling important.

5.4.3.2 CS PCA

The CS-D (n=224) had an adequate sample (KMO=0.95) and item correlation (Bartlett's test of sphericity x^2 (741) = 5477.69, p<0.001). Six components had an eigenvalue of greater than 1, which together explained 62.19% of the variance. However, component 1 explained around two-thirds of this variance (42.71%), while the other 5 components explained less than 7% each. The top 5 CS-D items that loaded most highly on component 1 were a mixture of strategies related to pleasurable, evaluation, help seeking and socialising strategies.

The CS-M (n=212) also had an appropriate sample (KMO=0.96) and item correlation (Bartlett's test of sphericity x^2 (741) = 6585.32, p<0.001). Five components with eigenvalues greater than 1 explained 66.91% of the variance in combination. However, component 1 explained around two-thirds of this variance (47.28%), while the other 4 components explained less than 9% each. The top 5 CS-M items that loaded most highly on component 1 all related to avoiding over-stimulation.

5.4.3.3 Summary

Despite the scree plots (Appendix 14 for EWS and 15 for CS) suggesting the extraction of the first 4 components for EWS-D and the first 2 for EWS-M and both coping measures, there was not a clear justification for extracting more than the first component because adding more components explained very little additional variance. Further, the first component on its own leaves a lot of variation unexplained on all measures. Therefore, in the absence of clear additional components the remaining variation must be due to idiosyncrasies between participants, or additional factors that are not captured by the questionnaire. Even taking the first 2 to 4 components highlighted by the scree plots leaves a lot of the variation unexplained. Thus, caution should be paid when making conclusions based on these results due to a lot of variation in the data being due to variation in the individuals that is not accounted for by their use of EWS or CS.

Overall, the majority of variance on all measures was explained by component 1. Further, item loadings were similar for component 1 but for the other components were quite dissimilar and associations with underlying themes were tentative. EWS for depression were best explained by signs of anxiety, worry, loss of interest and motivation and ideas slowed and EWS for hypomania by feeling disinhibited, racing thoughts and feeling important. CS for depression were best explained by a mixture of pleasurable, evaluative, help seeking and socialising strategies. The CS-M was the only measure on which the top 5 most highly loading items related to one theme, namely avoiding overstimulation.

In summary, EWS and CS for people with BD did not generally relate to any particular underlying themes according to results from the PCAs. Rather, it appeared that a mixture of EWS and CS were used when attempting to manage mood, suggesting that perhaps patterns of early warning sign recognition and coping strategy use are idiosyncratic and cannot be neatly categorised.

5.4.4 EWS recognition and temporal patterns

5.4.4.1 Identification of the most commonly recognised EWS (aim 3a)

To identify the EWS most commonly recognised *early* in relapse (aim 3a), the derived variable of the sum of 'early' responses for the EWS checklists was used. Sixty percent was used as the 'high endorsement' cut-off for both checklists and 'low endorsement' cut-offs were 20% for EWS-D and 10% for EWS-M because these points appeared to be a step change for *early* responses shown on Figure 17 (EWS-D) and 18 (EWS-M). These cut-offs are also highlighted by the black lines on Tables 69 and 70.

Tables 69 (EWS-D) and 70 (EWS-M) present the most (above the black line) and least (below the black line) frequently endorsed items as *early* warning signs for each type of mood episode. Low energy, low motivation, feeling tired, loss of interest in activities, feeling anxious and worrying a lot were the most frequently recognised *early* signs of depression.

Being more talkative, not being able to get to sleep, being more energetic/active and feeling emotionally high were the most frequently recognised *early* signs of hypomania. Lobban et al. (2011) obtained similar results using the same measures. For both mood episode types, using street drugs was the least frequently recognised *early* sign of relapse.

Table 69: EWS-D Items Most Commonly Endorsed as Early Vs. Later Stages

Item number	Description	% early endorsement
1	low energy	70
2	low motivation	70
3	feeling tired	67
9	loss of interest in activities	63
20	feeling anxious	63
19	worrying a lot	61
21	afraid of going crazy	20
22	being uncooperative	20
30	drinking too much	17
31	using sleeping tablets	16
32	using street drugs	4

Table 70: EWS-M Items Most Commonly Endorsed as Early Vs. Later Stages

Item number	Description	% early endorsement
6	more talkative	67
14	can't get off to sleep	66
13	energetic/active	64
1	emotionally high	61
20	auditory hallucinations	9
18	thinking thoughts are being controlled	9
12	visual hallucinations	5
27	street drugs	4

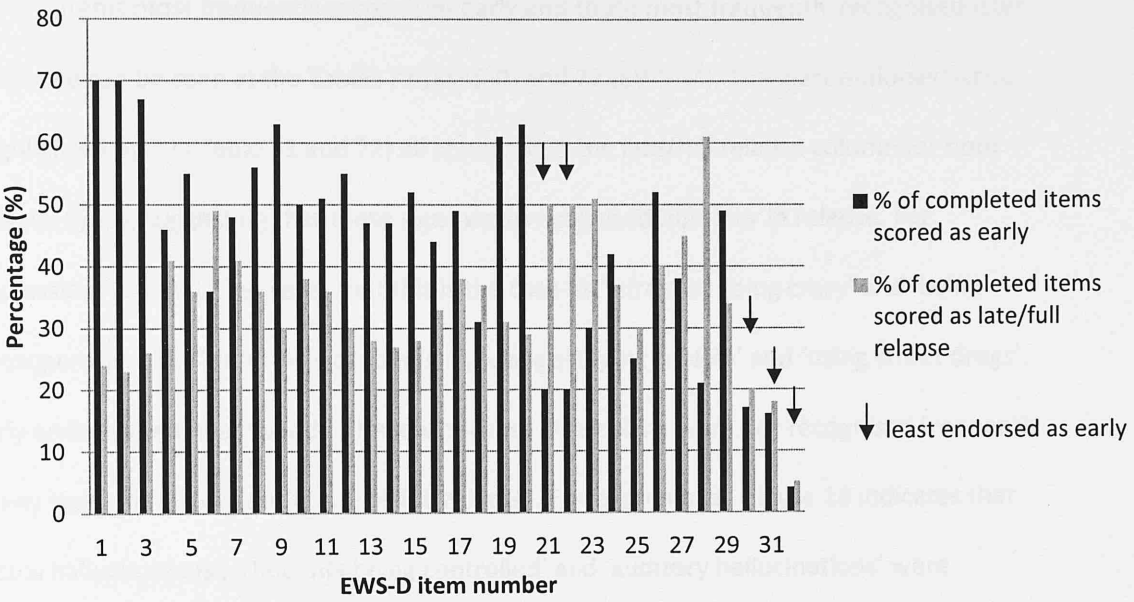


Figure 17: EWS-D-early vs. late/full relapse recognition

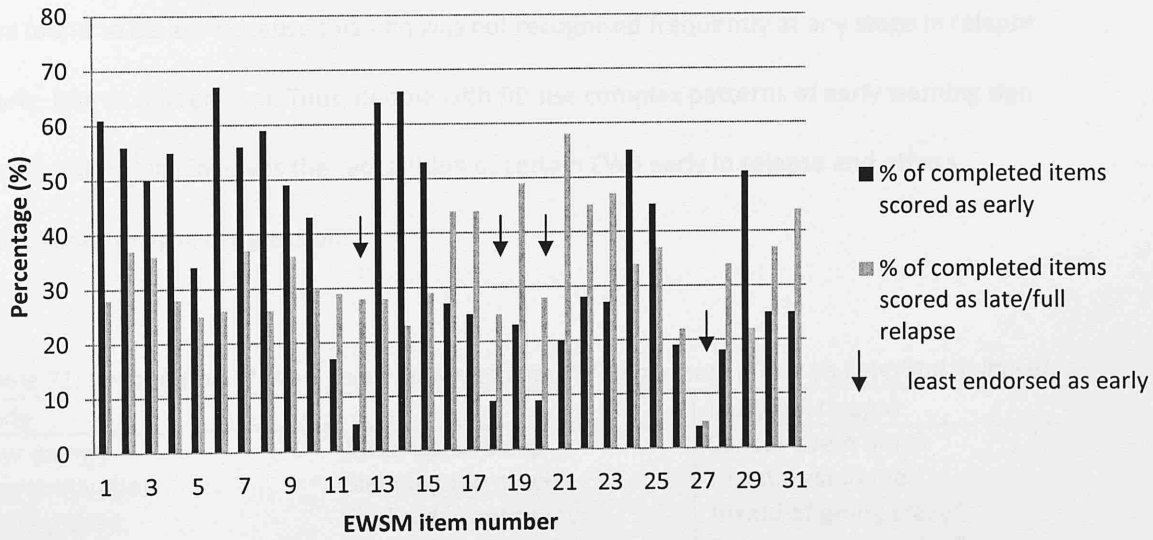


Figure 18: EWS-M-e*arly vs. late/full relapse recognition*

5.4.4.2 An examination of temporal patterns in symptom recognition (aim 3b)

To examine the temporal pattern of symptom recognition (aim 3b) and specifically whether the signs least endorsed as *early* for each mood episode type were being recognised at a later stage in relapse *or* not being recognised at all, late and full relapse responses were combined and compared to early responses (for a visual comparison see figures 17 and 18). EWS were recognised early (*n*=22 69%), opposed to at later stages (*n*=10 31%) for depression than mania (*n*=17 (53%) early and *n*=15 (47%) later stages).

Items most frequently recognised early and those most frequently recognised later in relapse can be seen in the Tables 71 (EWS-D) and 72 (EWS-M). The least endorsed items (highlighted by * in Table 71 and 72) all appeared in the late/full relapse column for both episode types, suggesting that these signs *were* recognised but later in relapse. For depression, Figure 17 indicates that this is the case for 'afraid of going crazy' and 'being uncooperative' but for 'drinking too much', 'using sleeping tablets' and 'using street drugs', early endorsement was found to be low because these signs were not recognised frequently at any stage in relapse (early, late or full relapse). For hypomania, Figure 18 indicates that 'visual hallucinations', 'thoughts being controlled' and 'auditory hallucinations' were recognised later in relapse most frequently but for 'using street drugs' early endorsement was found to be low because this sign was not recognised frequently at any stage in relapse (early, late or full relapse). Thus, people with BD use complex patterns of early warning sign recognition which involves the recognition of certain EWS early in relapse and others throughout relapse progression.

Table 71: Recognition of the 5 Least Endorsed Signs of Depression (Early Vs Late/Full Relapse)

Early		Late/Full relapse
Low energy	Interrupted sleep	Senses seem duller
Low motivation	Sleeping too much	Disinterest in food
Feeling tired	Feel sad/want to cry	**Afraid of going crazy***
Ideas slowed down	Worrying a lot	**Being uncooperative***
Difficulty concentrating	Feeling anxious	Neglecting hygiene/appearance
Less talkative	Not able to get up in the morning	Feeling very guilty
Negative thoughts pop into mind	Lots of aches and pains	Thinking about suicide / death
Loss of interest in activities	Cannot face normal tasks	**Drinking too much***
Loss of interest in people	Feeling agitated / restless	**Using sleeping tablets***
Want to be alone	Cannot get off to sleep	**Using street drugs***
Less interest in sex	Feeling irritable	

Table 72: Recognition of the 5 Least Endorsed Signs of Hypomania (Early Vs Late/Full Relapse)

Early	Late/Full relapse
Emotionally high	Feeling religious
Ideas too fast	**Visual hallucinations***
Difficulty concentrating	Uncooperative
Sense seem sharper	Feeling in another world
Colours seem brighter/more vivid	**Thinking thoughts are being controlled***
More talkative	Bizarre thoughts
Racing thoughts	**Auditory hallucinations***
Feeling creative	Disinhibited/outrageous
Irritable	Feeling strong/powerful
Stronger interest in sex	Feeling important
Energetic/active	Heavy alcohol drinking
Cannot get off to sleep	**Using street drugs***
Spending money	Reckless pleasure seeking
Not needing much sleep	Wanting to party all night
Involved in many projects	Risk taking

5.4.5 Common CS and frequency of use

5.4.5.1 Identification of the most common CS used consistently (aim 4a)

To identify the CS most commonly used consistently (all the time) to manage mood (aim 4a), the derived variable of 'all the time' for the CS questionnaires was used. No 'high consistency' cut-offs were needed due to clear outliers on figures 19 and 20. Cut-off for 'low consistency' was 5% because it appeared to be a step change on figures 19 (CS-D) and 20 (CS-M). These cut-offs are also highlighted by the black lines on Tables 73 and 74.

Tables 73 (CS-D) and 74 (CS-M) show the most (above the black line on Tables 73 and 74) and least (below the black line on Tables 73 and 74) consistently used CS. Medication use was the most consistently used coping strategy for depression (used all-the-time by 66% of the sample and a clear outlier on Figure 19) and hypomania (used all-the-time by 30% of the sample and a clear outlier on Figure 20). In addition, participants reported enjoying the feelings as a consistent coping strategy for hypomania (used all-the-time by 29% of the sample and also a clear outlier on Figure 20. The CS used least consistently to manage symptoms of depression was 'chat to people in internet chat rooms'. The least consistently used CS to manage symptoms of hypomania were 'cut down the number of things doing' and 'made sure didn't overwork by having breaks'.

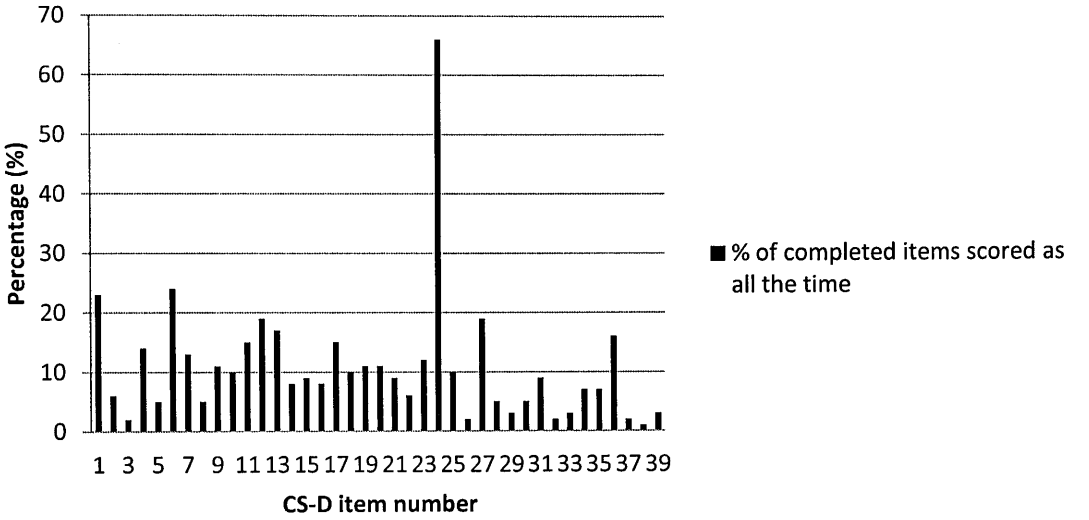


Figure 19: CS most consistently used to cope with depression

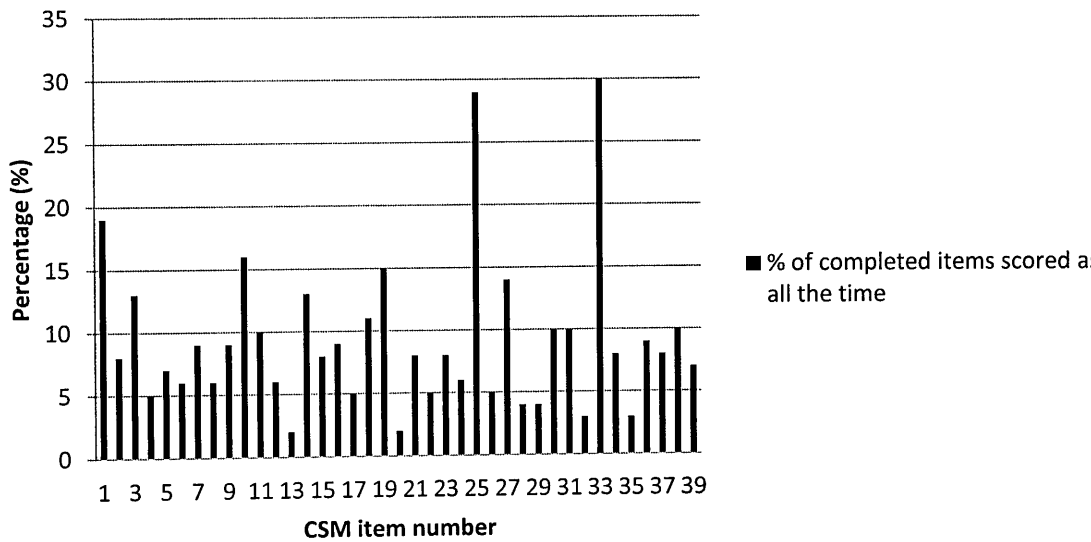


Figure 20: CS most consistently used to cope with hypomania

Table 73: CS-D Items Endorsed as All-The-Time Description

Item number	Description	% all the time endorsement
24	continued/started meds	66
33	Support services	3
39	took extra work	3
29	Did something reckless	3
37	Tried to hurt self	2
32	alternative therapy	2
26	used illegal subs	2
3	took extra meds without prescription	2
38	chat to people in internet chat rooms	1

Table 74: CS-M Items Endorsed as All-The-Time Description

Item number	Description	% all the time endorsement
33	started meds again	30
25	enjoyed the feelings	29
29	distracted self/switch off from racing thoughts	4
28	avoided situations in which might talk too much	4
35	maintained balance rest/activity	3
32	listened to others telling me I'm ill	3
13	Cut down on no. things doing	2
20	made sure didn't overwork by having breaks	2

5.4.5.2 Distinguishing between consistent and intermittent use of CS (aim 4b)

To distinguish between CS used consistently and those used intermittently (aim 4b) and to specifically examine whether the CS that were not used consistently were being used intermittently (sometimes/often) or not at all, the percentage of total endorsement was calculated out of the maximum possible score on the CS questionnaires (264x4=1056). See figures 21 and 22. Overall endorsement (whether sometimes, often or all-the-time) was highest for medication use, avoiding people, seeking professional help and relaxing for depression and enjoying the feelings, continuing with several activities, following instincts and becoming irritable and ignoring others for mania.

The least used CS for depression were using illegal substances and chatting to people in internet chat rooms and for hypomania was blaming others. The outliers evident on figures 21 and 22 were no longer present, suggesting that the majority of CS were used sometimes or often rather than all-the-time. This was particularly evident on Figure 22 for hypomania.

Tables 75 (CS-D) and 76 (CS-M) display CS used all the time compared to those used the most overall (whether that was sometimes, often or all the time). The CS for depression that tended to be used most (overall) by participants were also the strategies that tended to be used all-the-time. This suggests that people with BD generally use these CS for depression on a continuous basis. The fact that 'tried to relax' was high on total endorsement but not 'all the time' endorsement suggests that participants frequently 'tried to relax' sometimes and/or often (see Table 75). The CS for hypomania that tended to be used most by

participants were *not* the same strategies that tended to be used all-the-time. Only 'enjoyed the feelings' showed high total and 'all the time' endorsement. Although 'started medication again' was one of the most consistently used CS, it only accounted for 15% of the total endorsement. This suggests that people with BD generally use these CS for hypomania on an intermittent basis (see Table 76).

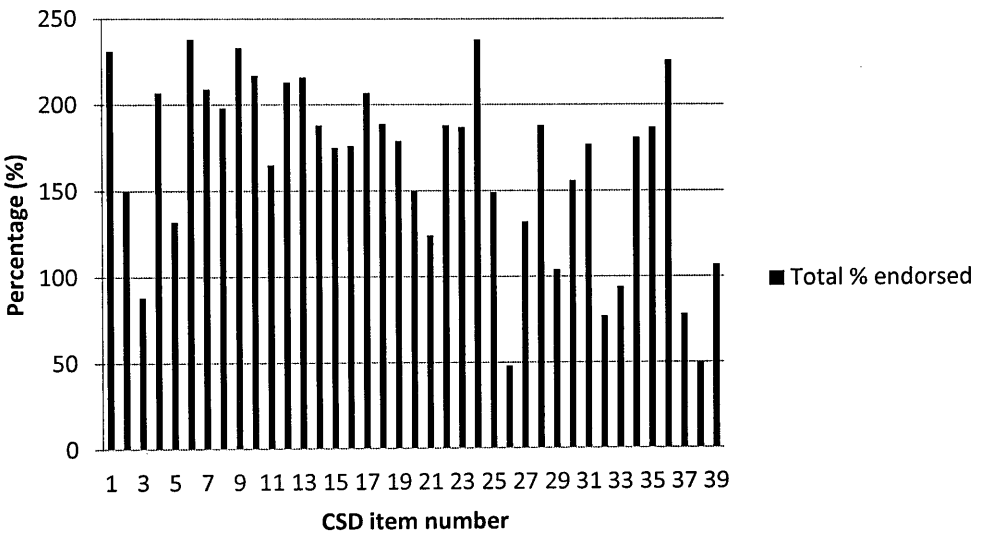


Figure 21: CS-D total percentage endorsement per item

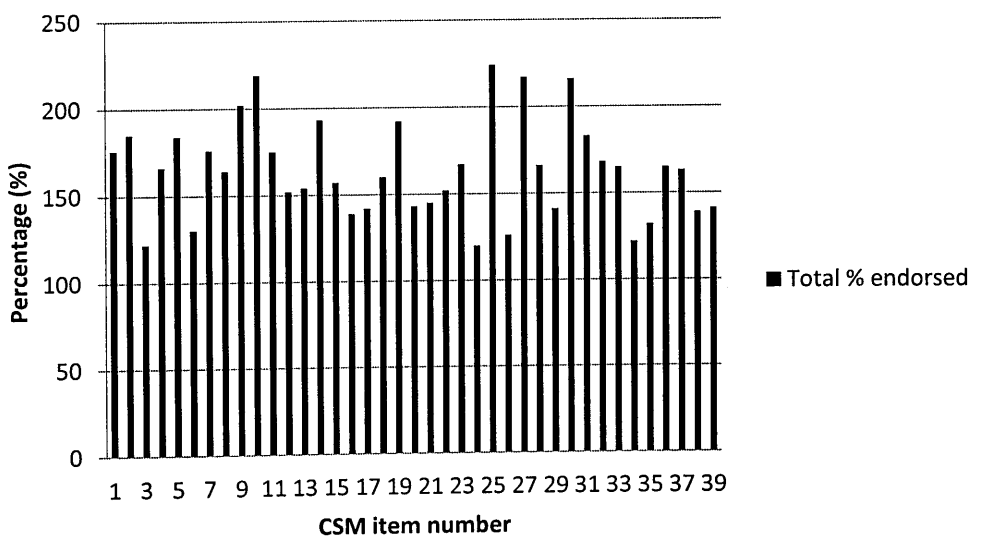


Figure 22: CS-M total percentage endorsement per item

Table 75: CS-D Items Endorsed as All-The-Time Vs Total Endorsement

Item number	Description	% total endorsement	% all-the-time endorsement
24	continued/started meds	23	66
6	avoided being with people	23	24
1	sought professional help	22	23
9	Tried to relax	22	11
33	Support services	9	3
3	Took meds without prescription	8	2
37	Tried to hurt myself	7	2
32	Alternative therapy	7	2
38	Chat to people in internet chat rooms	5	1
26	Used illegal subs	5	2

Table 76: CS-D Items Endorsed as All-The-Time Vs Total Endorsement

Item number	Description	% total endorsement	% all-the-time endorsement
25	Enjoyed feelings	21	29
10	continued with several activities/projects	21	16
27	followed my instincts and acted accordingly	21	14
30	became irritable and ignored what others said	20	10
26	tried to calm self by writing down racing thoughts	12	5
34	prayed	12	8
3	reminded self of time I was in hospital due to manic depression	12	13
24	Blamed others	11	6

5.4.6 An examination of whether the CS reported to be used the most were also those perceived to be most helpful for mood management *(aim 5)*

To examine whether the CS used the most (whether sometimes, often or all-the-time i.e. total endorsement) were reported as being helpful for symptom reduction (aim 5), Tables 77 and 78 were comprised displaying how helpful each strategy was across all participants.

5.4.6.1 How helpful were the CS used the most for managing depression?

The CS used the most to manage symptoms of depression are highlighted (by *) in Table 77. Medication use, seeking professional help and trying to relax were among those

used the most and were also deemed by participants to be helpful for managing low mood. Despite being used the most, avoiding people was not reported as a helpful strategy for coping with depression according to self-ratings. Statistically, there was a moderate significant positive correlation (r=0.38, p=0.02) between the strategies used the most to cope with depression and those reported as most helpful for managing low mood. Figure 23 highlights this relationship..

Self-rated helpful strategies for coping with depression revolved around medication use, seeking help, organisation/routine, distraction from (or realistic evaluation of) negative thoughts, fun/creative activity and increasing time with others. The strategies reported to be least helpful mainly revolved around ignoring symptoms and eating more.

Table 77: Helpful CS for Depression

Item	How helpful (proportion out of 5=very helpful)
24: Continued/started prescription medication*	**3.82**
1: Sought professional help*	**3.55**
7: Sought support/advice from a relative/friend I trusted	3.46
18: Engaged in a creative activity	3.3
31: Contacted NHS keyworker or other service	3.27
30: Increased time with others	3.26
15: Established/maintained a good daily routine	3.26
28: Did something for fun/pleasure	3.24
10: Got organised & tried to keep busy	3.24
9: Tried to relax*	**3.21**
8: Recognised unrealistic thoughts & evaluated if things were worth worrying about	3.18
34: Read self help literature & tried to follow the advice	3.13
22: Distracted myself/switched off from negative thoughts	3.11
39: Took on extra work	2.99
17: Confronted my feelings & tried to figure out what was bothering me	2.99
2:Tried to follow an exercise plan	2.97
33: Sought contact with self help org	2.95
19: Monitored my mood	2.94
5: Used problem solving strategies	2.92
32: Sought out an alternative therapy practitioner	2.88
20: Laughed & tried to find humour in my situation	2.88
25: Prayed	2.86
13: Cut down on the number of things I was doing	2.84

36: Watched TV	2.75
12: Slept a lot	2.6
27: Smoked more cigarettes	2.58
6: Avoided being with people*	**2.57**
3: Took extra non-prescription medication	2.49
11: Drank more tea/coffee	2.39
38: Chatted to people on internet chartrooms	2.27
16: Daydreamed & fantasised	2.18
37: Tried to hurt self	2.16
14: Went on as if nothing had happened hoping symptoms would go away	2.15
26: Used illegal subs	2.14
29: Did something reckless/dangerous	2.07
21: Drank more alcohol	2.06
4: Stayed in bed and hoped it would go away	2.04
35: Did nothing	2.02
23: Ate a lot	1.99

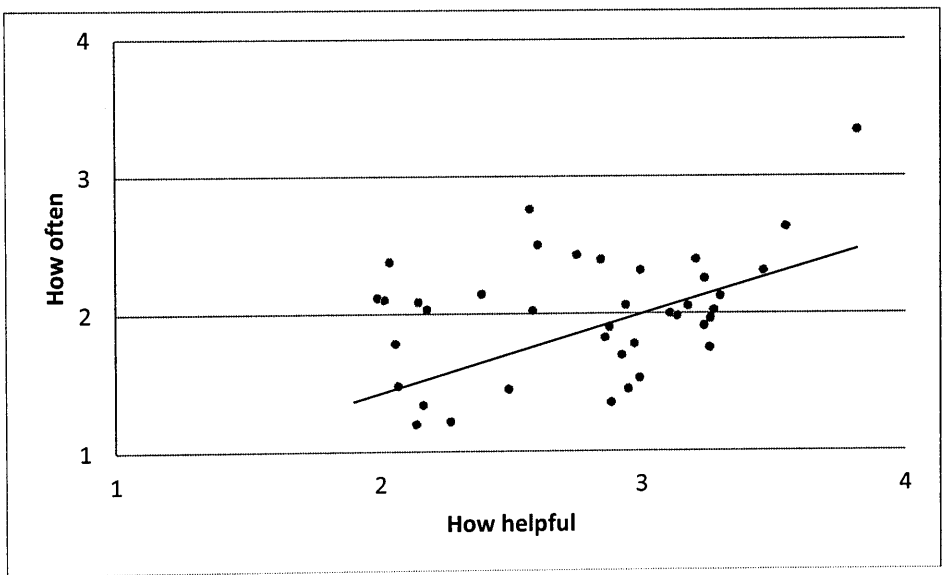


Figure 23: How often were the helpful CS-D used?

5.4.6.2 How helpful were the CS used the most for managing mania?

The CS used the most for management of high mood are highlighted (by *) in Table 78. In contrast to depression, the CS used the most for mania were reported to be relatively unhelpful. This was particularly true for becoming irritable and ignoring others. There was no statistically significant correlation between how helpful CS were and how much they were used (r=-0.11, p=0.52). Figure 24 further highlights this.

Self-rated helpful strategies for coping with mania revolved around medication use, seeking help, having a good routine (including a balance of rest and activity, relaxing, taking breaks and cutting down on/prioritising tasks), monitoring (of symptoms, behaviour and sleep), distracting from/switching off racing thoughts, listen to others, not acting hastily and avoiding situations where one might talk too much/inappropriately. Strategies reported as unhelpful revolved around denial and blame.

Table 78: Helpful CS for Mania

Item	How helpful (proportion out of 5=very helpful)
33: Started medication again	3.76
1: Sought professional help	3.57
7: Sought support/advice from a relative/friend I trusted	3.46
37: Avoided/tried to reduce environmental stress	3.45
15: Established a good daily routine	3.37
35: Maintained a balance of rest & activity	3.32
9:Tired to relax	3.29
31: Accepted that symptoms could be a sign of an impending manic episode	3.24
22: Avoided over-stimulation	3.22
18: Looked out for other hypomanic symptoms	3.21
28: Avoided situations in which I might talk too much/inappropriately	3.19
29: Distracted myself/actively switched off from racing thoughts	3.16
16: Monitored sleep patterns	3.16
32: Listened to others telling me I was ill	3.15
17: Prioritised things & did minimal essential activities only	3.13
11: Tried to recognise & monitor my mood	3.13
20: Made sure that I did not overwork by having breaks in between tasks	3.12
5: Tried not to act too hastily/follow my first hunch	3.08
13: Cut down on the number of things I was doing	3.08
2: Tried to monitor & retrain my behaviour	3.07
23: Tried to reason with myself that things were going over the top	3.01
4: Tried to rest/sleep more	2.98
34: Prayed	2.97
3: Reminded myself of the time I was in hospital because of manic depression	2.93
6:Avoided being with people	2.88
26: Tried to calm myself down by writing down my racing	2.80

thoughts	
38: Prepared myself for the worst possible outcome	2.77
10: Continued with several activities/projects*	**2.76**
25: Enjoyed the feelings*	**2.78**
12: Said "stop" to my racing thoughts	2.58
27: Following my instinct & acted accordingly*	**2.56**
36: Tried to make up by taking on more	2.19
39: Did nothing	2.11
14: Went on as if nothing had happened hoping that symptoms would go away	2.10
24: Blamed other people	2.04
19: Denied/ignored symptoms	2.01
30: Became irritable & ignored what others said*	**1.93**
21: Drank more	1.92
8: Took it out on other people	1.69

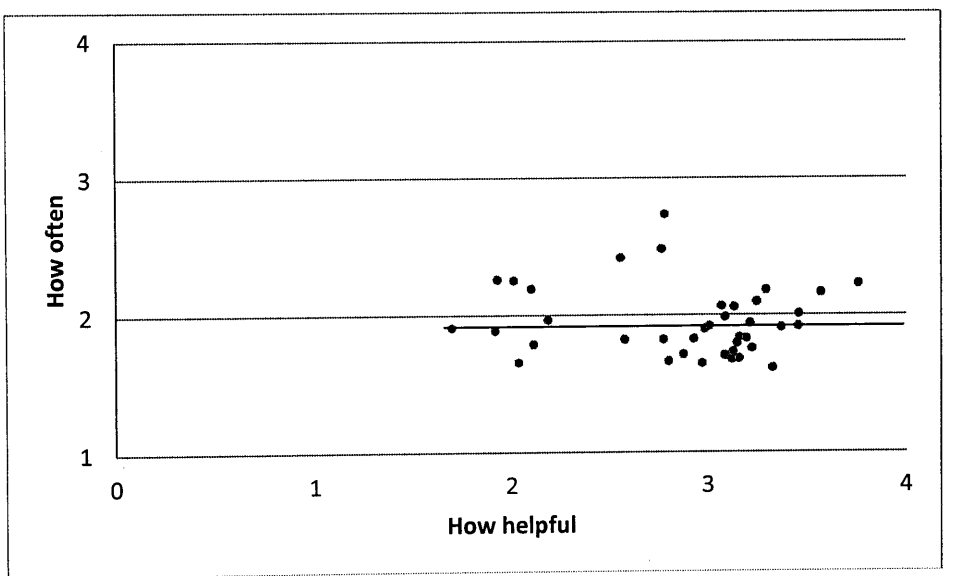


Figure 24: How often were the helpful CS-M used?

5.5 Discussion

5.5.1 Summary of main findings

Based on the SRM, the mood management model proposed in the current study suggests that to manage mood effectively, people with BD must detect signs of relapse early enough in the prodromal phase (stage 1: detection) to allow time to employ CS (stage 4b: CS implementation) that are evaluated as being helpful (stage 5a: evaluation) to prevent an impending episode. At the detection stage, people with BD generally only monitored occasionally for early EWS of an impending depressive or manic episode and detected some

signs early in relapse and others throughout relapse progression (late stages and full relapse). More EWS were recognised early (opposed to late/full relapse) for depression than mania and overall people with BD reported more EWS of depression than mania. Low energy, low motivation, feeling tired, loss of interest in activities, feeling anxious and worrying a lot were the most commonly recognised EWS of depression. Being more talkative, trouble getting to sleep, feeling more energetic and feeling emotionally high were the most commonly reported EWS of mania. At the implementation stage, people with BD generally implemented strategies to cope with depression that were consistent with the self-regulation of mood (medication use, help seeking and relaxing). In contrast, CS implemented to manage mania were likely to exacerbate symptoms and lead to a risk of relapse (enjoying the high, continuing with several activities, following instincts and acting accordingly and becoming irritable and ignoring what others said). Additionally, when participants themselves were asked to evaluate (stage 5a: evaluation) the CS used the most to cope with depression, the majority were rated as helpful while the strategies used the most to cope with mania were all rated as unhelpful.

5.5.2 The stages of mood management

5.5.2.1 Associations between EWS and CS for depression and mania (stages 1 & 4b)

In line with previous research (Lam & Wong, 1997; Lam et al., 2001; Perich et al., 2013), recognition of EWS and frequency of coping strategy use in relation to depression and mania were positively correlated. This suggests that the ability to detect EWS and employ CS is not associated more with either episode type. Rather than selectively attending to and managing signs of high *or* low mood, people with BD detect and manage symptoms of high and low mood fluctuations simultaneously. There was only a weak correlation between frequency of monitoring for EWS and frequency of CS use for both depression and mania, suggesting that monitoring more often for EWS does not impact on how often CS will be

employed. However, previous research has found that more frequent monitoring for EWS was associated with better social and occupational functioning (Lobban et al., 2011). Further research is required to assess whether increased monitoring is helpful for mood management or whether people who manage mood better are more vigilant to EWS. Additionally, further research is needed to understand how monitoring for EWS is linked to employing CS and how this impacts on outcome. Relapse rates were not investigated in the current research due to constraints of using PARADES data (see Section 5.5.6.2)

Results from the PCAs revealed that EWS and CS for people with BD did not generally relate to any particular underlying constructs. Rather, it appeared that a mixture of EWS and CS were used when attempting to manage mood, suggesting that perhaps patterns of early warning sign recognition and coping strategy use are idiosyncratic and cannot be neatly categorised. For these reasons treatment interventions for BD should tailor treatment to the patient to target idiosyncratic EWS and CS used by the individual to manage mood, while also being aware of common EWS and CS (see below).

5.5.2.2 Detection of EWS of relapse (stage 1)

The majority of participants were able to recognise EWS of mania and depression. However, in contrast to previous studies (Keitner et al., 1996; Lam & Wong, 1997; Mantere et al., 2008; Smith & Tarrier, 1992), more participants reported EWS of depression than mania (79% of participants were able to report EWS of depression compared to 69% for mania). This may have been because previous studies have used samples of people with BD I only. People with BD I may be more vigilant to changes in mood that may indicate an impending manic episode due to associated negative consequences such as psychosis and hospitalisation. Nineteen percent of the current sample were diagnosed with BD II. This group do not experience functional impairment due to high mood (APA, 2000) and therefore may be more vigilant to signs of depression and be more motivated to recognise such signs

at an early stage in relapse to prevent relapse of depression. Other studies using samples of BD I and II have found similar results (Breit-Gabauer et al., 2010; Goossens et al., 2010).

Using a larger sample and focussing on *early* signs of relapse, results from previous research regarding the most common prodromes of depression and mania were replicated. The most commonly recognised EWS for depression were low energy, low motivation, feeling tired, loss of interest in activities, feeling anxious, and worrying a lot. Interestingly, low motivation, loss of interest, anxiety and worry were also highlighted as being important signs of depressive relapse in the PCA. The most commonly recognised EWS for mania were being more talkative, can't get off to sleep, more energetic/active and feeling emotionally high. There was no consistency between these signs and the ones revealed as important through the PCA. Lobban et al. (2011) reported the same top 3 most commonly reported EWS for depression and mania and these results are also highly consistent with previous studies (e.g. Lam & Wong, 2005; Goossens et al., 2010). Therefore, to aid the development of interventions that support people with BD to recognise EWS of relapse, it may be important for clinicians to be aware of common EWS of depression and mania.

5.5.2.2.1 Temporal patterns to detection of EWS

More EWS were recognised early (opposed to late/full relapse) for depression than mania. This could, again, be because the sample included participants with BD II who may be less motivated to detect signs of hypomania because, for them, hypomania is a pleasant experience. In relation to both high and low mood, people with BD used a complex pattern of early warning sign recognition involving detection of certain EWS early in relapse (as noted above) and others throughout relapse progression (late stages and full relapse). Investigation of how this pattern of recognition impacts of relapse rate may reveal important clinical implications. By categorising prodromal symptoms as early, late and full relapse and examining whether recognition of signs at one particular stage is associated with a reduction

in relapse rate, clinicians will be afforded an awareness of how important it is to intervene early in the prodromal phase to prevent relapse.

5.5.2.3 Coping strategy implementation (stage 4b) and evaluation (stage 5a)

People with BD tended to use CS for depression consistently but intermittently for mania. Interestingly, medication was used consistently to cope with low mood but was used intermittently to cope with high mood. A reluctance to adhere to medication consistently when trying to regulate high mood may be due to a reluctance to reduce positive emotion, as evidenced by the prevalent use of 'enjoying the high' in the current study (see below) and consistent with previous research which suggests people with BD strive for, and enjoy, a mild state of hypomania (Lam et al., 2004; Lam et al., 2005; Lee et al., 2010; Wright et al., 2005). However, antidepressants are often prescribed as prophylactic medication and instructed to be taken consistently while medication to manage mania is often prescribed for use 'as required'. Therefore inconsistent use of medication for mania was perhaps unsurprising. What is important is that the benefits of adherence to mood stabilising medication in response to EWS of mania are discussed in therapy so that people with BD are aware of the implications of 'running with the high' and administering medication too late to prevent an impending manic episode.

When managing low mood, people with BD moved through the model of mood management in a way that was consistent with the self regulation of mood. The most commonly used CS (whether used sometimes, often or all the time) for depression were medication use, avoiding being with people, trying to relax and seeking professional help. Help seeking was also highlighted as important for coping with low mood in the PCA. All but one (avoiding being with people) of these CS were rated as helpful by participants themselves and were consistent with Lam and Wong's (1997) 'good' CS and Lam et al.'s (2001) behavioural CS which were related to fewer relapses. The least helpful CS for

depression were in line with Lam and Wong's (1997) 'poor' CS and Lam et al.'s (2001) maladaptive CS which they found related to increased relapses. The fact that there was some consistency between the types of EWS and CS revealed as being important in managing depression through the PCA and the most commonly reported EWS and CS, further supports the idea that people with BD manage depressed mood in a way that is consistent with self-regulation. In contrast, there was no consistency between the items revealed as important for managing high mood through the PCA and those most commonly reported EWS and CS, suggesting that management of high mood may not be in line with the self regulation of mood. Indeed, when trying to manage high mood people with BD reported using CS that were inconsistent with self regulation of mood. The most commonly used CS (whether used sometimes, often or all the time) for mania were enjoying the feelings of a high, continuing with several activities/projects, following instincts and acting accordingly and becoming irritable and ignoring what others said. These strategies were in direct contrast to the 'avoiding overstimulation' strategies revealed as important for managing high mood in the PCA and were consistent with Lam and Wong's (1997) 'poor' CS, Wong and Lam's (1999) denial strategies and Lam et al.'s (2001) stimulating strategies. All of these strategies are inconsistent with the down-regulation of high mood and are related to increased relapses (Lam et al. 2001). In all of these previous studies, CS were categorised as adaptive/maladaptive by the authors. The current study found that when the participants themselves were asked to rate how helpful these common strategies were for mood management, all of them were rated as relatively unhelpful. Periods of elevation pose a particular problem because they can lead to a manic episode if not curtailed which can be dangerous, yet on the other hand such periods can be extremely pleasurable and sought after. Therefore people with BD may struggle with the conflict between enjoying elevated mood but employing CS at the optimal time to avoiding an episode of mania. Previous research has highlighted the importance of effective coping for mania. For example, Lam et

al. (2001) found that coping with manic prodromes (but not depressive) predicted relapse at 18 month follow-up.

The most helpful CS for mania were consistent with Lam and Wong's (1997) calming activities/restraining behaviours, Wong and Lam's (1999) stimulation reduction and seeking professional help and Lam et al.'s (2001) modifying excessive behaviour (which was related to fewer relapses) and early medical intervention. Therefore, a challenge for intervention may be promoting the use of helpful CS (e.g. stimulation reduction and professional help) for mania that dampen the positive emotions people with BD seek to feel. Interventions that entail teaching people to do the opposite from what they desire requires empathy about drive on the part of the clinician.

5.5.5 Implications for treatment

It should be acknowledged that this research was unable to establish any causal patterns to the processes involved in mood management due to a cross-sectional design. Thus, prospective research is required to test the causal relationship between mood management processes in BD and risk of relapse before the true impact of the following implications is revealed.

Advancing understanding regarding early warning sign recognition and use of CS by people with BD is paramount to developing effective strategies for relapse reduction. Although people with BD are able to detect EWS of depression and mania, they reported only monitoring for these signs occasionally. During therapy people with BD could be encouraged to monitor for early signs of relapse more frequently and be taught to recognise common EWS for mania and depression while also exploring idiosyncratic signals in order to create an individualised plan of mood management. In theory this should be happening as part of clinical practice, however at least half of the current sample were recruited through mental health services yet they were still reporting sporadic monitoring of EWS. If people

with BD can effectively monitor for and identify EWS early in the prodromal stage, effective CS can be implemented to reduce the risk of relapse (Colom et al., 2003; Lam et al., 2003; Lobban et al., 2010; Perry et al., 1999). However, an important issue to consider when teaching people to recognise and respond to EWS is the possibility of causing hypervigilance to symptoms resulting in increased anxiety. Therefore, before encouraging clinicians to promote increased monitoring for EWS more research is needed to evaluate the positive and negative impacts, and individual differences in the benefits and pitfalls, of increased monitoring. Frequent vigilance to EWS may help some people with BD to stay well but for others may lead to negative consequences such as anxiety.

The current research also found a temporal pattern in detection of warning signs for depressive and manic relapse. In some cases, services do not intervene until a person with BD has reached crisis point. However, if future research reveals a positive association between signs recognised early (opposed to later in relapse) and a reduction in relapse rate then the need for early intervention (once the first signs of relapse are recognised) to curtail an impending episode will be highlighted. This may require services to adapt in ways that facilitate early responses to EWS, rather than crisis responses to relapses. It also offers opportunities to involve relatives and close friends who are often the first to notice EWS, though care needs to be taken to do this in a way that facilitates supportive relationships and does not exacerbate controlling or intrusive interpersonal dynamics.

Introducing stimulation reduction strategies to manage high mood may pose the biggest challenge for interventions related to coping with BD. The most commonly implemented CS for mania were related to stimulating behaviours that would likely escalate mood and were therefore contrary to mood management. Interventions that promote techniques to modify these strategies and promote alternatives that are more consistent with managing mood (stimulation reduction strategies such as working consistently to avoid falling behind rather than taking on more to catch up and increasing activity) may not be

accepted by people with BD. Periods of elevation pose a particular problem because they can lead to a manic episode if not curtailed which can be dangerous, yet on the other hand such periods can be extremely pleasurable and sought after. Therefore people with BD may struggle with the conflict between enjoying elevated mood and employing CS at the optimal time to avoid an episode of mania. The current study highlights how common it is for people with BD to 'run with the high', suggesting that it may be difficult to resist. Further, people with BD know that the strategies implemented to cope with high mood are unhelpful (they specifically reported this) yet implement them anyway. Perhaps this is due to a powerful pull to feel good when one experiences elevated mood or a lack of alternative strategies. These issues should be acknowledged and worked into therapy in order to help people to manage high mood. Thus, what may be important for therapy is helping people with BD to weigh up the pros and cons of going with the high mood and teaching them strategies that may work to moderate elevated mood while giving them control over what they choose to do.

5.5.6 Limitations

The results of this study should be considered within the confines of several limitations listed below.

5.5.6 1 Study design

Information regarding EWS and CS was gathered through retrospective questionnaires using a cross-sectional design and so data could have been distorted by recall bias. However, all participants were euthymic and so chances of recall bias were reduced. Further, mood management model has been studied in real-time in a naturalistic study using ESM (Chapter 3) and a comparison of the results from these two studies forms part of the overall discussion for this thesis (Chapter 6). The limitations of using a cross-sectional design are discussed in the following section (5.5.6.2).

All analyses were exploratory in nature and the data discussed in this study was, on the most part, descriptive. Therefore, relationships between variables and the direction and strength of associations require systematic testing in future research following a formal power calculation.

5.5.6.2 Constraints of using PARADES data

Examination of how group psychoeducation versus peer support affected ability to detect EWS, employ effective CS and how this impacted on relapse rates was not possible due to the author being employed as a Research Assistant on the PARADES RCT and therefore being required to remain blind to group allocation. Further, relapse rate was a primary outcome measure of the PARADES RCT and therefore analysis of relapses would have constituted interim analysis, thus compromising the results of the PARADES trial. Due to constraints on examining relapse rate in the current study, the impact of early warning sign recognition, frequency of monitoring for EWS, and frequency of coping strategy use on outcome could not be examined and so future research should aim to do this. Longitudinal data (over a 2 year follow-up period) regarding EWS, CS and relapse rates has been collected through the PARADES RCT and can therefore be examined in the future to assess how EWS and CS change with group therapy or peer support and what impact this has on relapse rates. Additionally, data on past treatment history was not collected and should therefore be incorporated into future research. The fact that half of the sample had been randomised to receive psychoeducation in which they were specifically taught to detect EWS and employ effective CS was not an issue for this study because only baseline data were used.

5.5.6.3 The sample

The majority of participants in the current study were female, British, unemployed and had experienced 20 or more bipolar episodes. A number of studies have found no

differences in socio-demographic or clinical variables between BD participants who could and could not detect EWS (e.g. Lam & Wong, 1997; Lam et al., 2001). Similarly, previous studies have found no correlation between socio-demographic or clinical variables and coping styles (e.g. Parikh et al., 2007). However, socio-demographic and clinical variables were not included in current analyses and therefore future research is required to determine whether these variables had an impact on the detection of EWS and use of CS in the current research.

Additionally, the current sample contained only people with BD who had referred into a 21 week trial of group psychoeducation or peer support for BD. These people may be in some way different from those not motivated to seek help or engage in therapy. However, the sample recruited for the PARADES RCT were recruited from multiple sites across the North West of England and Nottingham and from a variety of services including primary and secondary NHS services, self-help organisations and via self referral.

5.5.6.4 Measures

The current study used predetermined checklists which ensured the exploration of a range of EWS and CS and comparability of findings. However, participants may endorse more symptoms when using a checklist than when responding to open questions (Sierra et al., 2007) and spontaneous idiosyncratic EWS and CS cannot be examined. Data regarding idiosyncratic EWS and CS has been collected through the PARADES RCT and can therefore be examined in future research. Further, an open question format to explore coping in BD was used in another study as part of this PhD (see Chapter 3).

It is important to note that a problem with studying coping in BD, and therefore with this study, is defining what constitutes 'coping'. We all react behaviourally to mood changes and so some of the CS reported in this study may actually be reactions to feeling high or low rather than intentional implementation of selected CS. For example, the 'avoiding people'

item on the CS-D may be a common response to feeling depressed because low mood makes you feel like avoiding people. Whether an individual would say they were using avoiding people to 'cope' with low mood or experiencing it as a symptom of low mood may depend on how the individual understands the term 'coping'. With regard to mania, this study found that when the participants themselves were asked to rate how helpful common CS were for mood management, all of them were rated as relatively unhelpful. However, participants may have been doing these things in reaction to high mood rather than using them to cope with high mood. An important part of intervention may be to work with people to empathise with what they will naturally want to do when mood begins to evaluate (and discuss the possible consequences related to such strategies) and offer alternative, adaptive CS (and discuss the possible consequences of these strategies) in order for people with BD to make an informed decision about how they want to manage mood.

Finally, the EWS and CS questionnaires did not measure mood at time of reporting and therefore current mood could have confounded the EWS and CS reported. However, all participants had been episode free for 4 weeks prior to completing the questionnaires and previous research has found that EWS and CS reported were not related to current mood symptoms in a samples of BD participants in remission (Lobban et al., 2011; Parikh et al., 2007).

5.5.7 Future directions

It is important that the relationships between variables and the direction and strength of associations be systematically tested in future research following a formal power calculation. Additionally, future research is required to determine whether socio-demographic and clinical variables (including treatment history) had an impact on the detection of EWS and use of CS in the current research.

This study was cross-sectional and so cannot provide comment on how mood management strategies predict relapse in the long term. Specifically, the impact of frequency and temporal patterns of early warning sign recognition, frequency of monitoring for EWS, and frequency of coping strategy use on outcome in BD could not be examined due to constraints on examining relapse rate in data provided by the PARADES RCT. However, longitudinal data (over a 2 year follow-up period) regarding EWS, CS and relapse rates has been collected through the PARADES RCT and can therefore be examined in the future to assess how EWS and CS change with group therapy or peer support and what impact this has on relapse rates.

Finally, future research should aim to tighten up the definition of coping to distinguish thoughts and behaviours that are a reaction to altered mood state from strategies employed specifically to manage mood.

5.6 Conclusion

Despite the limitations discussed, this study extended previous research on EWS and CS in BD by using a larger sample and asking participants directly about perceived helpfulness of common CS. People with BD were able to identify common EWS of depression (low energy, low motivation, feeling tired, loss of interest in activities, feeling anxious and worrying a lot) and mania (being more talkative, trouble getting to sleep, feeling more energetic and feeling emotionally high) and generally employ helpful CS to deal with low mood (medication use, help seeking and relaxing). The most commonly used CS for mania were related to stimulating behaviours (enjoying the high, continuing with several activities, following instincts and acting accordingly and becoming irritable and ignoring what others said) that would likely escalate mood and were therefore contrary to mood management. Thus, what may be most important for therapy is helping people with BD to weigh up the

pros and cons of going with the high mood and teaching them strategies that may work to moderate elevated mood while giving them control over what they choose to do.

CHAPTER 6: GENERAL DISCUSSION

6.1 Overview

This section integrates the findings from all three studies (Study 1 using ESM; Study 2 using a MIP; and Study 3 using a cross-sectional survey design) in relation to the research aims. The overall aim of the research was to examine mood management processes in BD using a novel framework (the mood management model) based on the SRM (Leventhal et al., 1984). Specifically, the aim was to explore how people with BD move through the 5 stages of mood management proposed in this model (detection of mood variation; interpretation; intention; coping strategy selection and implementation; evaluation; and repetition) and also to highlight any differences in the processes involved in mood management between people with and without BD. In addition to examining the current findings in relation to the SRM this section also explores the current findings in relation to other models of BD and presents the clinical implications of this research along with the limitations and recommendations for future research.

6.1.1 Main findings

Even during a normal week of daily life when bipolar symptoms were in remission, people with BD experienced elevated fluctuations in mood compared to non-clinical controls that may require self-management in order to prevent relapse. However, people with BD did not appear to be hypervigilant to signs of an impending episode according to time taken to detect a mood change following MI and reports of sporadic monitoring for changes in mood related experiences for EWS of a mood episode. Additionally, results revealed a complex pattern of EWS recognition in BD (with some signs detected early in relapse and others throughout relapse progression) that warrants further investigation to understand how detection of EWS at different stages of relapse impacts on the course of BD. Interestingly, more EWS were recognised early (opposed to late/full relapse) for depression than mania

and overall people with BD reported more EWS of depression (e.g. low energy, low motivation, feeling tired, loss of interest in activities, feeling anxious and worrying a lot) than mania (e.g. being more talkative, trouble getting to sleep, feeling more energetic and feeling emotionally high). Perhaps the more insidious onset usually experienced for depression makes it easier to detect than mania, or perhaps people with BD are more motivated to detect signs of depression than mania due to a desire to prevent the negative consequences associated with low mood and experience the positive consequences associated with hypomania.

Following the detection of a mood change, people with BD believed they had less personal control over their mood, found mood changes less comprehensible, were more likely to attribute a mood change to factors related to the self (self dispositional appraisal style) and perceived a mood change would have a shorter duration compared to controls. Interestingly, when controlling for current mood, people with BD perceived more positive consequences related to current mood which may have important implications for treatment i.e. the promotion of the positive aspects of BD.

Contrary to predictions and previous research, there were no statistically significant group differences in intention to modify mood in both studies 1 and 2, suggesting that people with BD were not more likely to strive for positive mood states than controls. However, patterns of intentions following MI conflicted with this result and revealed that people with BD did in fact intend to make mood go up even after positive MI, thus indicating vulnerability to mania following an upward shift in mood. These results require further testing with a larger sample.

The current research also explored how people try to cope with mood changes when they occur. Following MI (positive and negative) people with BD were more likely to *select* CS which were likely to exacerbate symptoms of depression (negative rumination and dampening of positive emotion). However, survey reports revealed that people with BD

tended to *implement* strategies to cope with depression (e.g. medication use, seeking professional help, avoiding people, and trying to relax) that were likely to reduce symptoms of depression (other than avoiding people) and were consistent with the self-regulation of mood. In contrast, CS reported as being implemented in the past to manage mania were likely to exacerbate symptoms and lead to a risk of relapse (e.g. enjoying the high, continuing with several activities/projects, following instincts and becoming irritable and ignoring what others said).

Finally, when participants were asked to evaluate the CS they implemented most often to cope with depression the majority were rated as helpful while the strategies implemented to cope with mania were all rated as unhelpful. Thus, people with BD reported implementing strategies for mania that they were aware were unlikely to be helpful in down-regulating mood, suggesting that people with BD want to make their mood go up or perhaps are unaware of alternative, more helpful CS for high mood.

These findings will be discussed in more detail below.

6.1.2 Comparing findings across studies

The mood management model was tested in 3 separate studies: Study 1 using ESM; Study 2 using a MI procedure; and Study 3 using a cross-sectional survey design. The 3 methodologies used were not viewed as competing alternatives but rather as complementary approaches providing triangulated evidence from different methodologies to test the validity of outcomes from any one study. ESM can address questions regarding mood variability and temporal associations between constructs in real time that MI and cross-sectional designs cannot. MI allowed testing of specific hypotheses using manipulation of mood while holding other variables constant and gave a more powerful test of hypothesised causal relationships. Finally, the survey approach offers a broader examination of everyday behaviour in a larger sample, increasing external validity of findings.

Using multiple methodologies allowed comparisons to be made across studies to examine whether mood management processes in a controlled environment (Study 2) match mood management processes in real life (Study 1) and, if not, the reasons for a discrepancy. Figure 25 highlights the stages at which differences were found in how people with and without BD manage mood in studies 1 and 2 and Table 79 provides a description of these differences. These findings will be discussed in more detail below.

Study 3 focussed on detection of EWS (stage 1) and coping strategy implementation (stage 4b) and evaluation (stage 5a) in a large sample of people with BD. No group differences were being tested; rather the aim was to explore these stages in more detail. Therefore, the main findings from this study are discussed in the following sections but are not represented in Figure 25.

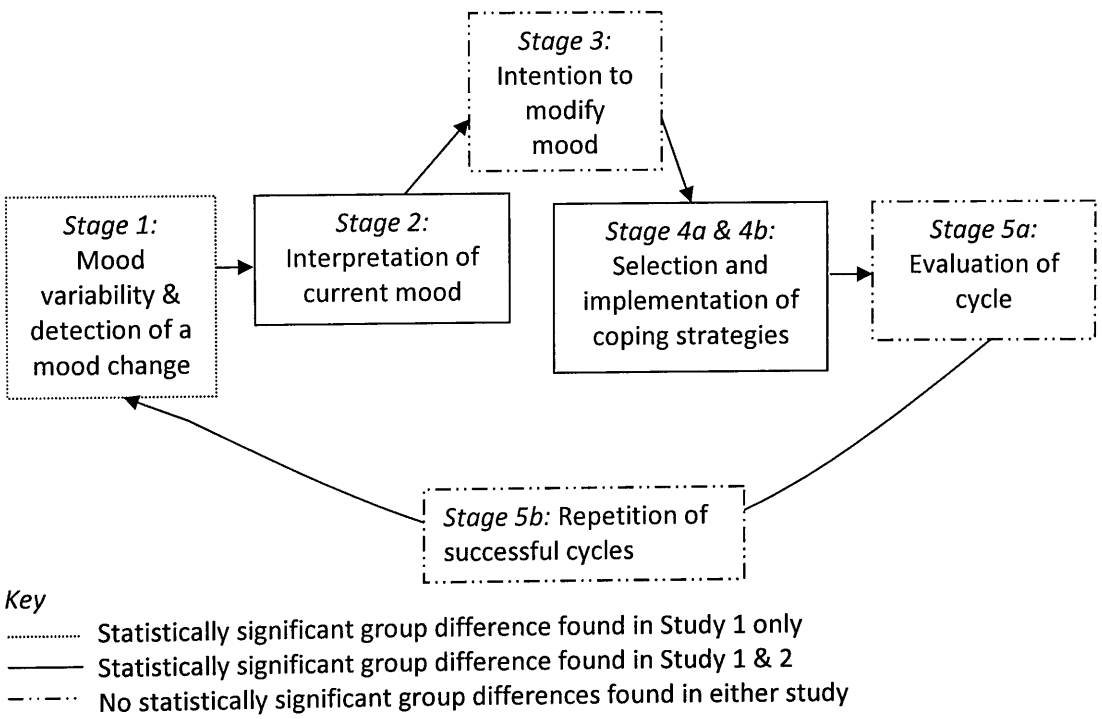


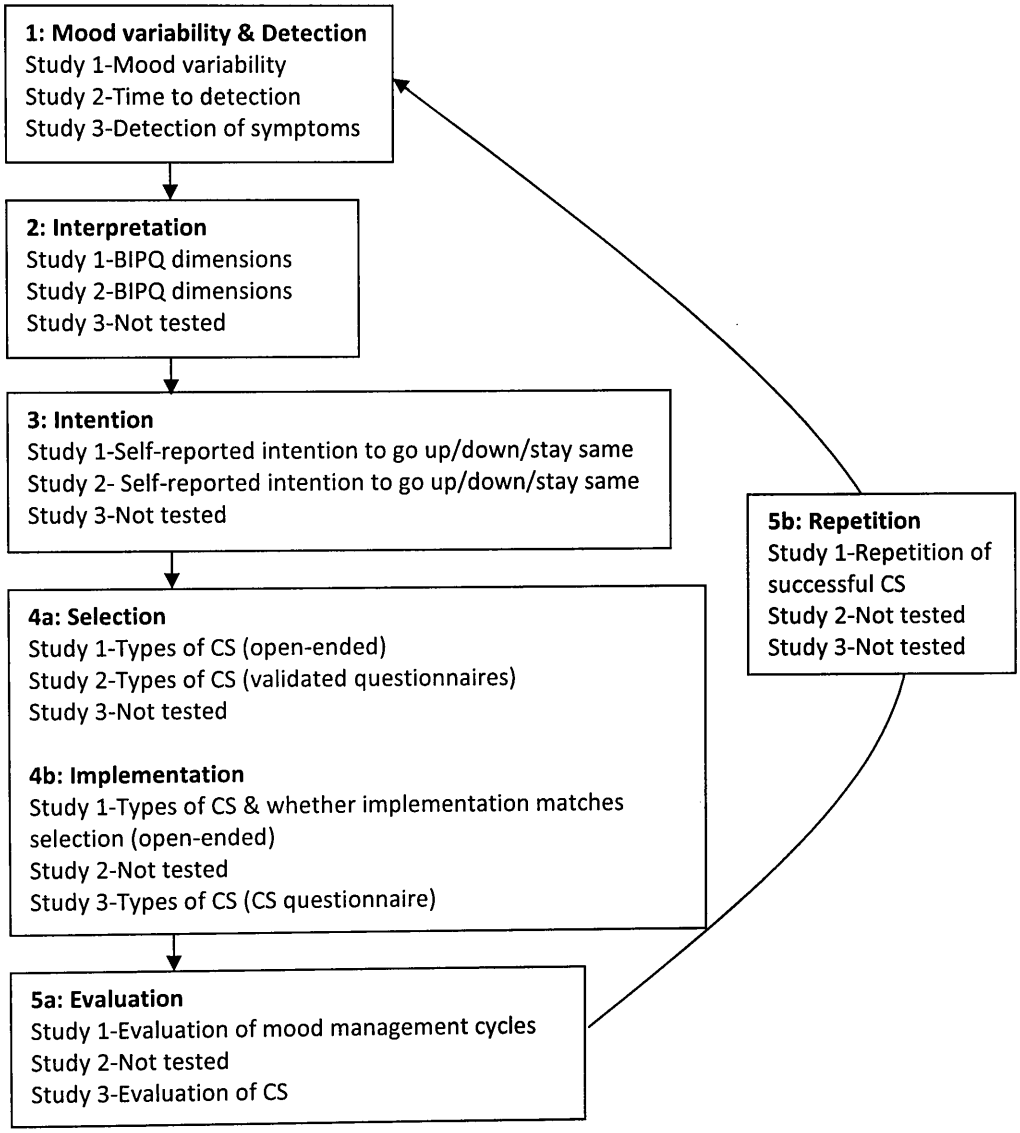
Figure 25: The mood management model: Group differences across studies 1 and 2

Table 79: The Mood Management Model: Group Differences across Studies 1 and 2

Stage	Study 1 (ESM)	Study 2 (MI)
1: Mood variability & detection	People with BD experienced significantly more variability in mood during a typical week of daily life compared to healthy controls.	No group differences in time taken to detect a mood change therefore bipolar participants did not appear to be more vigilant to mood changes.
2: Interpretation	Using both ESM and a MI procedure differences were found in how people with and without BD interpret mood, therefore this stage may be particularly important in mood regulation and warrant further prospective research to examine the impact of interpretation on outcome in BD.	
3: Intention	Neither study found any statistically significant group differences in intention to modify mood i.e. when low, both groups wanted to make mood go up and when neutral or high both groups wanted to make mood stay the same. However, patterns of intentions following positive MI suggested people with BD were more likely to intend to make mood go up following positive MI compared to controls and so these results require further testing with a larger sample.	
4a & 4b: Coping strategy selection & implementation	Using both ESM and a MI procedure differences were found in the strategies selected and implemented to manage mood, therefore this stage may be particularly important in mood regulation and warrant further prospective research to examine the impact of interpretation on outcome in BD.	
5a: Evaluation	No significant group differences. Testing with a larger sample is required to confirm the null findings.	No significant group differences. Testing with a larger sample is required to confirm the null findings.
5b: Repetition	No significant group differences. Testing with a larger sample is required to confirm the null findings.	No significant group differences. Testing with a larger sample is required to confirm the null findings.

The mood management model proposed in the current research consists of 5 stages: detection and mood variability; interpretation; intention; coping strategy selection and implementation; evaluation; and repetition. Firstly, this section amalgamates the findings related to each stage of the mood management model from all 3 studies (as a reminder, Figure 26 highlights the studies in which the specific stages were tested in the current research). Secondly, how the current findings relate to the SRM and the other psychological

models of BD is discussed. Finally, the clinical implications of the current research findings are presented along with the limitations of this research and suggestions for future directions.



Key
Study 1 = ESM
Study 2 = MI
Study 3 = survey design
BIPQ = Brief Illness Perception Questionnaire
CS = Coping Strategies

Figure 26: How the stages of mood management were tested

6.2 An examination of the 5 stages of mood management: an integration of current findings

6.2.1 Stage 1: Detection and mood variability

6.2.1.1 Overview

Although people with BD experienced more mood variability compared to controls, they were not faster at detecting a mood change and monitored for early signs of an impending episode on a sporadic basis. Therefore, the minor changes in mood experienced by people with BD during periods of remission may warrant further attention in order to prevent escalation to more major changes associated with bipolar episodes. Further, people with BD reported more signs related to low compared to high mood and recognised more signs of depression early in relapse compared to mania. Therefore, intervention may be best focussed on early detection of manic episodes to improve the course of BD. The details and implications of these findings are discussed below.

6.2.1.2 Integration of findings

Using ESM (Study 1) the current research was able to explore mood instability in daily life. In line with previous ESM research (Knowles et al., 2007), Study 1 revealed that people with BD experienced significantly more variability in both PA, and particularly, NA compared to controls outside of episode, during a normal week of daily life. Despite the bipolar group reporting significantly higher average NA and significantly lower average PA compared to controls and suggestions that more pronounced fluctuations in mood could be associated with symptoms of depression and mania (Pavlickova et al., 2013), group differences in PA and NA were unlikely to have impacted largely on results regarding mood variability due to the group differences in PA and NA being small. Further, whether assessments should control for mood symptoms when exploring mood variability in BD is debatable (see Section 6.7). Thus, in daily life people with BD showed increased mood

fluctuations compared to controls, which may impact on vigilance to mood changes. However, Study 2 revealed no significant differences between people with and without BD in time taken to detect a change in mood, suggesting that increased mood variability does not lead to increased vigilance to mood changes in order to employ self-management strategies to prevent relapse. Similarly, Study 3 revealed that people with BD tended to monitor for early signs of an impending depressive or manic episode occasionally. Frequency of monitoring for EWS was similar across depression and mania and the number of signs recognised *early* in relation to depression and mania were positively correlated, suggesting that vigilance to EWS and the ability to detect EWS were not associated more with either episode type. However, on further investigation it was revealed that more participants were able to report EWS of depression than mania (79% of participants were able to detect EWS for depression compared to 69% of participants for mania) and that more EWS were recognised early (opposed to late/full relapse) for depression than mania. This result was in contrast to previous studies (Keitner et al., 1996; Lam & Wong, 1997; Mantere et al., 2008; Smith & Tarrier, 1992) that have found increased recognition for signs of mania compared to depression. A reason for the conflicting result may be that Study 3 included participants with BD II. Previous studies have only included people with BD I, who may be more vigilant to changes in mood that may indicate an impending manic episode due to associated negative consequences such as psychosis and hospitalisation. In BD II high mood (hypomania) is not severe enough to cause marked impairment in functioning (APA, 2000) and therefore people with BD II may be more vigilant to signs of depression and more motivated to recognise such signs at an early stage in relapse to prevent relapse of depression. Other studies using mixed samples of BD I and II have found similar results to the current research (Breit-Gabauer et al., 2010; Goossens et al., 2010).

Study 3 paid particular attention to the types of signs and symptoms detected by people with BD as *early* warning signs for an impending episode. Low energy, low

motivation, feeling tired, loss of interest in activities, feeling anxious and worrying a lot were the most commonly recognised EWS of depression. Being more talkative, trouble getting to sleep, feeling more energetic and feeling emotionally high were the most commonly reported EWS of mania. These results were consistent with previous research (e.g. Lam & Wong, 2005; Lobban et al., 2011; Goossens et al., 2010). Interestingly, a temporal pattern was evident in the recognition of EWS for depression and mania with some signs detected early in relapse and others throughout relapse progression (late stages and full relapse). This pattern has not been studied before and could have important implications for treatment (see Section 6.5).

6.2.2 Stage 2: Interpretation

6.2.2.1 Overview and a note on the effect of current mood

Without controlling for current mood, people with BD believed they had less control over their mood, understood their mood less, made more internal attributions for low to mood and were more concerned about mood compared to controls. When current mood was controlled for, people with BD also made more internal attributions for hypomanic symptoms, believed current mood would last for less time and associated current mood with more positive consequences compared to controls. Additionally, people with BD appeared no more concerned about current mood than people without. These findings suggest that the way in which mood in interpreted is important in BD because it may distinguish those who go on to experience more extreme episodes. However, prospective research is needed to understand how these interpretations impact on outcome for this clinical group.

It should be noted at the outset that inconsistencies between studies 1 and 2 regarding interpretations of mood can be explained by the effects of current mood. When PA and NA were controlled for in the analyses in Study 1 there was an impact on group differences in interpretations of consequences, concern and appraisal style. Specifically,

people with BD appeared to report more positive consequences, no more concern and more self-dispositional hypomanic appraisals compared to controls. Thus, without taking current mood into account, the results regarding differences between people with and without BD in interpretations of mood would have been different. Interestingly, all the interpretations affected by controlling for current mood related to positive aspects (i.e. interpretations of positive consequences, less concern and self-dispositional hypomanic appraisals) and therefore were masked by increased NA in BD. Once current mood was controlled for the picture of interpretations in BD that was revealed appeared more positive than was initially predicted. However, it should be noted that the utility of controlling for current mood when studying BD is debatable (see Section 6.7 for details).

6.2.2.2 Integration of findings

The interpretation stage includes several dimensions along which people interpret their mood related experiences. Each one is discussed in turn below.

6.2.2.2.1 Consequences

Study 1 and 2 assessed interpretations of both the positive and negative consequences related to current mood (Study 1) and following an induced change in mood (Study 2). Interpretations regarding consequences were tested in relation to direction (i.e. positive/negative) and magnitude (ignoring the direction).

6.2.2.2.1.1 Direction of consequences

As would be expected, current PA and the positive MI condition were associated with interpretations of significantly more positive consequences while current NA and the negative MI condition were associated with interpretations of significantly less positive consequences in both groups. However, without controlling for current mood people with

BD did not perceive more positive or negative consequences associated with mood compared to controls. This seems surprising given that, by definition, people with BD have experienced past episodes of hypo(mania) and depression which are associated with positive and negative consequences. Interestingly, when current mood was controlled for, people with BD interpreted significantly *more* positive consequences than controls.

In both studies, bipolar participants felt more NA on average. Study 1 revealed that higher NA was associated with interpretations of less positive consequences. Therefore, without adjusting for NA, bipolar participants appeared to interpret less positive consequences. These results have important implications for future research into the positive aspects of BD. Without considering current mood state, people with BD may not report positive aspects of the disorder due to low current mood. Therefore, positives in BD may be under-reported, resulting in a negatively biased picture of BD without affording proper attention to the positive aspects of hypomanic experiences (Seal et al., 2008) and positive psychological traits (Galvez et al., 2010; Lobban et al., 2012) associated with BD.

6.2.2.2.1.2 Magnitude of consequences

In both Study 1 and 2 there were no significant differences between people with and without BD in interpretations regarding the magnitude of consequences regardless of whether current mood was controlled. However, following positive MI, all participants in Study 2 perceived a significantly greater magnitude in consequences than following negative MI and control participants in the positive MI condition perceived a significantly greater magnitude in consequences than any other group-by-condition combination. Given that Study 1 revealed people with BD interpreted significantly more positive consequences than controls, this result seems unsurprising for the bipolar group and suggests that the greater magnitude in positive consequences relates to positive experiences (e.g. feeling happy, being productive etc) rather negative experiences of high mood (e.g. hospitalisation, psychosis

etc.). For the control group, these results suggest that the consequences associated with PA (e.g. positive mood, increased socialising, getting things done) are also greater than those associated with NA (e.g. decreased appetite, lack of energy and lack of interest). However, it should be noted that had PA and NA been controlled for in Study 2 there may not have been an effect of condition on interpretations of magnitude.

6.2.2.2.2 Personal control

In line with predictions and previous research (Lobban et al., 2013), both Study 1 and 2 found that people with BD interpreted significantly less personal control over mood than controls regardless of whether current mood was controlled for. Previous research (Crowe et al., 2012) and a number of theories view control as integral to the understanding of psychopathology (e.g. PCT; Powers, 1973) and specifically BD (ICM; Mansell et al., 2007). See Section 6.4 regarding implications of the current findings for the ICM. Given that people with BD experience extreme changes in mood that they are unable to curtail by their own efforts, it seems unsurprising that they perceived a lack of personal control over their emotions. If people with BD believe they lack control over their mood changes they may be less inclined to try to manage mood because they believe their efforts will be unsuccessful. Therefore, increasing a sense of personal control in BD during therapy may be important for increasing the use of self-management strategies aimed at reducing relapse. On the other hand, Mansell et al. (2007) suggest that it is the attempts to control mood that are the problem, rather than lack of attempts, therefore what may be more important in therapy is dealing with response styles to mood changes discussed in Section 6.2.4.

6.2.2.2.3 Concern

In line with previous findings (Lobban et al., 2013), Study 1 and 2 revealed increased perceptions of concern about mood in BD compared to controls without controlling for

current mood. When current mood was controlled for in Study 1 this difference disappeared (i.e. there were no longer any group differences in interpretations of concern). In both studies, bipolar participants reported more NA on average and Study 1 revealed that higher NA was associated with interpretation of more concern. Therefore, without adjusting for NA, bipolar participants appeared to interpret more concern due to feeling more NA, thus highlighting the potential implications of considering current mood state; without considering current mood we may over-emphasise the negative aspects of BD. See Section 6.7 for further details regarding controlling for current mood.

6.2.2.2.4 Comprehensibility

In line with predictions and studies of illness comprehension in other mental health disorders (e.g. Godoy-Izquierdo et al., 2007; Higbed & Fox, 2010), in both Study 1 and 2 people with BD found their mood significantly more difficult to understand than controls regardless of whether current mood was controlled for. These findings suggest that people with BD lack a coherent model regarding mood and mood fluctuations despite the development of formulations often being a significant part of clinical intervention (note that in Study 1 52% of the BD group were having current, or had received past, treatment for mood). Understanding mood swings in BD could be increased through techniques such a group psychoeducation where participants learn not only from mental health professionals but also from peers with the same disorder. If people with BD have a better understanding of the disorder perceptions of personal control over the disorder are likely to be increased and in turn the use of self-management strategies enhanced, thus reducing the risk of relapse.

6.2.2.2.5 Time line (duration)

By definition, people with BD have experienced prolonged periods of extreme mood changes, therefore it was predicted that people with BD would interpret a significantly

longer duration of mood than controls, based on these experiences. This prediction was not supported by the current results; in Study 2 (MI) there were no significant group differences in interpretations of the duration of a mood change without controlling for current mood and in Study 1 (ESM) people with BD interpreted a significantly shorter duration of current mood than the control group when current mood was controlled for. Healthy controls may have interpreted a longer time line because Study 1 (ESM) took place during a typical week in which both groups experienced only minor changes in mood. Therefore, if current mood remained within normal range for the study week, controls were interpreting a longer duration of normal mood and people with BD were reporting that normal mood would continue for a shorter duration. Given that people with BD experienced significantly more variability in mood during the same week this result is not surprising.

In Study 2, both groups interpreted a significantly longer time line in the positive MI condition than the negative MI condition. With regard to people with BD, this finding is in line with previous research that found that people with BD, and those vulnerable to BD, reported sustained elevations in positive affect following positive MI compared to controls (Farmer et al., 2006). A reason why controls also interpreted a longer time line following positive MI in Study 2 may have been that the MI procedure used only elicited minor increases in positive affect which were still within normal range. The fact that positive affect was harder to induce in the current study than negative affect suggests that normal mood for healthy controls is slightly elevated. Thus, controls were interpreting a longer duration of normal mood rather than high mood. The same could also be true for the bipolar sample in Study 2.

6.2.2.2.6 Cause

In line with predictions and previous research (Jones & Day, 2008), in studies 1 and 2 people with BD were more likely to attribute the cause of negative mood to internal

characteristics compared to controls regardless of whether current mood was controlled for. Such appraisals are likely to increase symptoms of depression, such as guilt and low self-esteem, while increasing feelings of low personal control over one's mood swings.

Without controlling for current mood, studies 1 and 2 found no significant differences between groups in internal attributions of hypomanic symptoms. However, when current mood was controlled for in Study 1, significant differences in self-dispositional hypomanic appraisals were revealed; bipolar participants showed increased use of this appraisal type compared to controls suggesting that they also attribute the cause of positive mood to internal characteristics. Study 1 found controls had higher average PA than bipolar participants and higher PA was associated with more self-dispositional hypomanic appraisals. Therefore, initially higher self-dispositional hypomanic appraisals by controls could be attributed to higher PA, or perhaps this appraisal style leads to increased PA. Future research is required to test these possibilities and explore the utility of controlling for current mood in bipolar research (see section 6.7 for details).

Contrary to predictions, Study 1 also found that people with BD interpreted significantly more normalising hypomanic appraisals than controls (as well as more hypomanic appraisals) when controlling for current mood. Hypomanic appraisals attribute the cause of mood to internal characteristics (e.g. being a talented or bad person) while normalising hypomanic appraisals attribute cause to external factors (e.g. the current situation or current problems). Thus, these dimensions are in direct contrast to each other. One reason for this finding could be that people with BD score higher on all measures. However, this is an unlikely explanation because the bipolar group did not score higher for normalising depressive appraisals. A more likely reason is due to a methodological limitation regarding the question about normalising hypomanic appraisals. It is not entirely clear that this question relates only to external attributions, for example 'things happen to being going well for me at present' could be extended by thoughts such as '...because I am a brilliant

person'. The question is not explicit about *why* things are going well and could be made to more clearly represent external attributions e.g. 'things happen to be going well for me present because of my current situation'.

6.2.3 Stage 3: Intention

6.2.3.1 Overview

Consistent with the self-regulation of mood and prevention of depression, people with and without BD intended to make mood go up following negative MI and when current mood was low. However, mixed results were obtained regarding intention to modify high mood, highlighting a methodological issue. When current mood was high both groups intended to keep mood the same rather than increase/decrease it and following positive MI people with BD were not *statistically* more likely to intend to make mood go up compared to controls. However patterns of intentions following positive MI revealed that over half of the bipolar sample intended to make mood go up while none of the control participants did. These results warrant further testing with larger samples to understand intentions to modify mood following positive MI and when current mood is high.

6.2.3.2 Integration of findings

Both Study 1 and 2 found no statistically significant group differences in intention to modify mood. Interestingly, only 1 participant with BD in both studies (note that this was not the same participant) intended to go down after negative MI (Study 2) and when in a low mood (Study 1). On experiencing negative affect an intention to further decrease mood could explain why people with BD suffer periods of depression. Investigation of intention to decrease mood following negative MI/when current mood is low mood should be conducted with a larger sample. In Study 2, patterns of intentions in the negative MI condition supported the lack of statistically significant group differences and highlighted that both

groups intended to go up following a downward change in mood. Similarly, in Study 1, participants in both groups were significantly more likely to intend to make mood go up if current mood was low compared to when current mood was neutral ('medium') or high. These results were in line with predictions based on the negative aspects of low mood.

When current mood was high the majority of controls (91%) and bipolar (87%) participants in Study 1 intended to keep mood the same rather than lower mood (controls=<1%, BD=3%) or make mood go higher (controls=8%, BD=10%). These results did not support the prediction that people with BD would be more likely than controls to intend to modify mood up when current mood was high due to striving for, and enjoying, a state of mild hypomania (Lam et al., 2004; Lam et al., 2005; Lee et al., 2010; Wright et al., 2005). However, only 28% of control and 26% of bipolar participants reported being in a high mood and so intentions to modify mood when high may have been constrained due to low numbers of participants in this mood state. Furthermore, patterns of intentions in Study 2 conflicted with the lack of a statistically significant difference between groups. While the entire control sample intended to stay the same following an upward change in mood, only 45% of the BD sample had this intention and the remaining 55% intended to make their mood go up. This pattern of results was in line with research that suggests people with BD strive for a mild hypomanic mood state (Lam et al., 2004; Lam et al., 2005; Lee et al., 2010; Wright et al., 2005) even after an upward change in mood (Wright et al., 2005). The reason why no significant group differences were found (despite an obvious divergence in patterns of intentions between groups) may have been the modest sample size which did not allow for enough power to detect small effects. Further research with larger samples is needed to understand intentions to modify mood in BD, particularly following positive MI and when current mood is high.

6.2.4 Stages 4a & 4b: Coping strategy selection and implementation

6.2.4.1 Overview

In Study 2, coping strategy *selection* was examined using factor analysed items from the Response Styles Questionnaire (RSQ; Nolen-Hoeksema, 1991) and the Responses to Positive Affect Questionnaire (RPA; Feldman et al., 2008) and in Study 3, strategy *implementation* was examined using the Coping Strategies Questionnaire (Lobban et al., 2011). In both of these studies responses were to closed questions and therefore idiosyncratic strategies used by some participants may have been missed. However, using Experience Sampling (Study 1) spontaneous, individualised CS were captured (regarding the selection and implementation of CS) using an open questions format.

Following MI (regardless of valance) people with BD tended to *select* CS likely to exacerbate symptoms of depression (i.e. negative rumination and dampening). However, in Study 3 people with BD reported *implementing* strategies in the past that were consistent with the self-regulation of low mood and prevention of depression (e.g. medication use, seeking professional help and relaxing). In contrast, strategies *implemented* to cope with high mood were likely to exacerbate symptoms and increase risk of mania (e.g. enjoying the high, continuing with several activities, following instincts and ignoring what others said). Thus, the current research highlighted a distinction between what people *intended* to do to manage mood (selection) and what they reported *actually* doing (implementation) i.e. although people with BD selected strategies likely to decrease symptoms of high mood they reported implementing strategies likely to escalate these symptoms. Note that what people report doing and what they actually do might be quite different. However, Study 1 used ESM to examine what people report actually doing in response to mood changes closer to the time at which CS are selected/implemented. During a typical week of daily life, bipolar participants selected (e.g. exercise) and implemented (e.g. cognitive behavioural, relaxing, sleep, daily activities and social interaction CS) different CS. Furthermore, control

participants *selected* more adaptive CS compared to bipolar participants but appeared to lack awareness of explicitly *implementing* strategies to manage mood (or perhaps did not frame responses as CS). Healthy controls reported using less CS overall compared to people with BD and specifically reported that they did not need to do anything/had not done anything to manage mood twice as often as people with BD. More research is needed to understand the distinction between CS selection and implementation in BD and to examine the causal relationship between CS and episodes of BD.

6.2.4.2 Integration of findings

Results from Study 2 revealed that people with BD selected significantly more CS associated with negative rumination and dampening of positive emotion than controls, regardless of MI condition. Negative rumination refers to behaviours or thoughts that focus one's attention on the depressive symptoms, while dampening refers to strategies that reduce the intensity and duration of the positive mood states once experienced. Both response styles are associated with increased depression and low mood (e.g. Feldman et al., 2008; Knowles et al., 2005; Pavlickova et al., 2013). Increased use of negative rumination and dampening could explain how the CS selected by people with BD exacerbate symptoms of depression and ultimately lead to a depressive episode. Interestingly, in both Study 1 and 2, people with BD also scored higher for self-dispositional depressive appraisals (interpretation stage) than controls. Coupled with a focus on depressive symptoms (negative rumination), these results indicate a tendency for people with BD to exhibit cognitive styles involving self-focus rather than focus outward. Focussing attention inwards in response to depressive symptoms may exacerbate such symptoms and explain why, on experiencing a slight downward mood change, people with BD may go on to experience a full blown episode of depression.

However, results from Study 3 were in contrast to this rather negative picture of mood management in BD. In Study 3, participants reported the most commonly implemented CS for depression to be medication use, avoiding being with people, trying to relax and seeking professional help. All of these strategies (with the exception of avoiding people which is consistent with increased inward focus in BD) were evaluated as being helpful for managing mood by the participants themselves (see Section 6.2.5 for evaluation). Thus, the strategies people *select* to manage mood may not necessarily be the strategies they actually *implement*. Indeed, results from Study 1 suggested just that. Participants with BD selected significantly more CS associated with exercise (and significantly less CS related to enjoyable activities) compared to control participants. However, participants with BD did not implement more CS associated with exercise but implemented significantly more of all of the other types of CS analysed compared to controls (other than those related to productivity/planning). This result indicates that healthy controls may be less self-aware of explicitly doing things to manage mood or perhaps do not frame responses as CS because they are not really having to cope with anything (i.e. not experiencing mood changes that indicate a mood episode and require management). In line with this suggestion, control participants in Study 1 reported that they did not need to do anything (selection), and that they had not done anything (implementation), to modify their mood twice as much as bipolar participants. Further, the BD group reported selecting and implementing more CS overall and the BD group implemented more CS that were selected at the previous time point (as a proportion of eligible responses) compared to the control group. Study 2 revealed that control participants had a tendency to select adaptive CS that are likely to promote mood stability and draw attention away from negative emotions. Perhaps healthy controls select adaptive CS but lack an awareness regarding the implementation of such strategies. On the other hand, people with BD may become more aware as a result of past experiences and treatment focussing on mood management in which they are explicitly taught to

monitor for EWS of relapse and employ adaptive CS (e.g. Colom & Vieta, 2006; Colom et al., 2009). Fifty two percent of the BD group were having current, or had received past, treatment for mood, while none of the control group had, or were having, treatment for mood.

A number of studies have found higher reports of positive rumination, but not dampening, in people at risk for BD and with BD compared to controls (Johnson et al., 2008b; Raes et al., 2009). However, these results were not replicated in Study 2 using MI, rather both groups reported more self-focussed positive rumination in the negative compared to positive MI condition. Previous studies have not included people with BD I and therefore may have underestimated the use of dampening. Only BD I suffer functional impairment due to elevated mood (APA, 2000) and so are likely to be motivated to decrease positive affect to avoid an episode of mania. In Study 2, 76% of the BD sample had BD I. These results are in line with previous research specifically using a sample of BD I compared to controls (Edge et al., 2013). However, in a mixed sample of BD I and II, Study 3 found that the most commonly implemented CS for mania were enjoying the feelings of a high, continuing with several activities/projects, following instincts and acting accordingly and becoming irritable and ignoring what others said. All of these CS are likely to exacerbate initial symptoms of high mood and may increase risk of a manic episode. Again, this conflict of results may be due to asking people in Study 2 what they *would* do to manage high mood (selection) and asking in Study 3 what they *have done* in the past to manage high mood (implementation). Without distinguishing between the two concepts, we may build a picture of mood management in BD that ignores a tendency to 'run with the high' and implement stimulating CS that may exacerbate symptoms of high mood because what people say they *will do* is dampen positive emotion but what they *actually do* is focus on it (positive rumination) and run with it.

Previous research has found that bipolar participants in a manic phase reported engaging in more dangerous activities than depressed/euthymic bipolar participants and

controls (Thomas et al., 2007; Van der Gucht et al., 2009). However Study 2 did not include anyone with significant hypomanic/manic symptoms and so the fact that there were no group differences in dangerous activities may be unsurprising. Further, in Study 1 and 3 endorsement of CS related to substance use (which may constitute a potentially dangerous activity) was low. Thus, unlike negative rumination which remains elevated when people with BD are in remission, use of dangerous activities may only be more prevalent in BD when in a manic phase. Rather than leading to mood elevation in BD, selection of dangerous activities may reflect behaviours associated with mania and may exacerbate symptoms once they are manifested.

Interestingly, there were no significant effects of MI condition (positive/negative) on group differences in the selection of negative rumination and dampening CS in Study 2. However, current mood did have an impact on selection and implementation of CS in Study 1. The cognitive/behavioural CS category was the category most closely linked to thoughts or behaviours specifically aimed at managing mood (including strategies such as not dwelling on negative thoughts, dealing with stressors and reflecting on positives) while the daily activities category was most in contrast to the idea of 'coping' (including activities such as cooking, child care and shopping) when compared to previous literature. All participants in a neutral ('medium') mood were significantly more likely to select daily activities and significantly less likely to select cognitive/behavioural CS, suggesting that when mood is relatively stable people are more likely to intend go about their normal routine rather than employ specific strategies to manage mood. When in a high mood, all participants were significantly more likely to select social interaction CS (and enjoyable activities) but significantly less likely to implement social interaction CS. All participants with the intention to go up were significantly more likely to *select* cognitive/behavioural, sleep and social interaction but were significantly more likely to *implement* daily activities and significantly less likely to *implement* social interaction than participants with the intention to stay

same/go down. Thus, to increase mood, people reported that they would engage in behaviours aimed at altering mood but actually tended to go about their normal daily lives. Again, these results highlight the importance of distinguishing between what people say they will do to manage mood (selection) and what they actually to do (implementation) to avoid over-emphasising the selection of strategies that are not implemented. Previous research has not distinguished between the selection and implementation of CS and so when asked what they have done in response to EWS (Lam & Wong 1997; Lam et al., 2001) participants' answers about strategies implemented in the past may have been contaminated with what was *selected* for implementation in the past.

6.2.5 Stage 5a: Evaluation

6.2.5.1 Overview

The CS implemented most often by people with BD to cope with low mood (medication use, seeking professional help, avoiding people and relaxing) were all (apart from avoiding people) reported by participants to be helpful and were consistent with the self-regulation of low mood and prevention of depression. In contrast, the CS implemented most often to cope with high mood (enjoying the high, continuing with several activities, following instincts and ignoring what others said) were all rated by participants as relatively unhelpful and were likely to exacerbate symptoms. Thus, people with BD may struggle with the conflict between enjoying elevated mood and employing CS at the optimal time to avoiding an episode of mania. This conflict should be a focus of future research with a view to developing better interventions for managing high mood in BD.

6.2.5.2 Integration of findings

6.2.5.2.1 Evaluation of mood management cycles

Results from Study 1 suggested that people with and without BD were able to evaluate mood management cycles successfully. The evaluation of mood management cycles as an entire process in BD has not been specifically examined previously, and due to large amounts of missing data in Study 1, would require further testing in future research in order to form any conclusions.

6.2.5.2.2 Evaluation of CS

Study 3 focussed on the specific evaluation of the CS used most often to manage both high and low mood. The only previous study of coping strategy evaluation in BD to ask participants directly to evaluate CS used (rather than categorisation being performed by the authors) was that by Depp et al. (2010), but this study did not make an important distinction between coping with high and low mood. Study 3 was the first study to ask people with BD themselves to evaluate how helpful CS were for mood management while also distinguishing between the CS that were helpful for managing high and low mood.

In contrast to the results from Study 2 which suggested that people with BD may exacerbate symptoms of low mood through negative rumination and dampening of positive emotions (selection stage), Study 3 found that people with BD moved through the model of mood management in a way that was consistent with the self regulation of low mood. The most commonly implemented CS for depression (see above) in Study 3 were all (with the exception of one-avoiding being with people) rated as helpful and were consistent with strategies highlighted as being important for coping with depression through a PCA conducted in Study 3, Lam and Wong's (1997) 'good' CS and Lam et al.'s (2001) behavioural CS which were related to fewer relapses. Thus, although people with BD *selected* CS that may exacerbate symptoms for depression (negative rumination and dampening), they

reported implementing CS that were consistent with effective management of low mood and likely to prevent relapses of depression.

Conversely, when trying to manage high mood people with BD reported using CS that were inconsistent with the self regulation of mood. The most commonly implemented CS for mania (see above) in Study 3 were all in direct contrast to the 'avoiding overstimulation' strategies revealed as important for managing high mood in the PCA conducted in Study 3 and were consistent with Lam and Wong's (1997) 'poor' CS, Wong and Lam's (1999) denial strategies and Lam et al.'s (2001) stimulating strategies. All of these strategies are inconsistent with the down-regulation of high mood and are related to increased manic relapses (Lam et al. 2001). When the participants themselves were asked to rate how helpful these common strategies were for managing high mood in the current research, all of them were rated as relatively unhelpful. So why would people with BD implement strategies they know are unhelpful for managing high mood? Previous research has reported that people with BD strive for, and enjoy, a mild state of hypomania (Lam et al., 2004; Lam et al., 2005; Lee et al., 2010; Wright et al., 2005). Thus, people with BD may struggle with the conflict between enjoying elevated mood and employing CS at the optimal time to avoiding an episode of mania. A challenge for intervention may be the promotion of helpful CS (e.g. stimulation reduction and seeking professional help) for mania that dampen the positive emotions people with BD seek to feel (see Section 6.5 for details of clinical implications). Indeed, previous research has highlighted the importance of effective coping for mania. For example, Lam et al. (2001) found that coping with manic prodromes (but not depressive) predicted relapse at 18 month follow-up. In Study 3, the most helpful CS for mania were consistent with Lam and Wong's (1997) calming activities/restraining behaviours, Wong and Lam's (1999) stimulation reduction and seeking professional help and Lam et al.'s (2001) modifying excessive behaviour (which was related to fewer relapses) and early medical intervention.

6.2.6 Stage 5b: Repetition

Study 1 attempted to examine the repetition stage of the mood management model. However, no conclusions could be drawn regarding group differences in the rate of repetition of successful mood management cycles due to a lack of variability in the data and low counts for the majority of CS. Consequentially, only a few CS could be formally analysed and analysis was conducted without accounting for the repeated measures structure of the data from Study 1. Future research is needed to test the hypothesis related to the repetition stage of the mood management model. Suggestions for improvements on the methods used in this research are made in Section 6.7.

6.3 The current findings and the SRM

The SRM (for diagram see Section 1.3.6) was chosen for the current research because it is widely applicable (to a range of health problems thus allowing comparisons across disorders), normalising (we all go through the same stages thus allowing comparisons between clinical and non-clinical populations) and dynamic (recognises that mood changes over time, can be reappraised and explains processes rather than phenomena at a fixed point). Thus, using the SRM the current research was able to make comparisons between people with and without BD in the processes involved in mood management to highlight where these groups differ. In Study 1 (ESM), the SRM framework was also used to explore how processes at one time point (e.g. intention at time 1) impact on processes at a later time point (e.g. coping at time 2). However, the current research did not compare mood management in BD with mood management in other disorders such as depression and so cannot comment on how specific mood management processes are to BD. This should be a focus of future research.

The SRM could be criticised for having too much breadth and is limited by a lack of research regarding BD. In contrast, the other models of BD reviewed in Section 1.3 could be criticised for having leapt to specificity without evidence and appear to overlap in their explanations of BD. Importantly, rather than place a model onto BD, this research used BD to inform a new model of mood management in BD (the mood management model, Figure 25 page 288) that integrates many of the concepts from other psychological models and expands the cognitive arm of the SRM. A critique of how the current findings support or undermine the SRM now follows in order to highlight how these findings move forward this theory in relation to BD and how the current data would lead to further theoretical development with future research.

6.3.1 SRM Stimulus -> Mood variability and detection

Findings suggest that increased mood variability in BD may act as a stimulus to initiate movement through the model and that this instability in mood relates to periods of time outside episode in normal, daily life. People with BD were able to detect EWS of depression and mania and so recognition of these signs could also act as a 'trigger' for the processes involved in mood management. Prospective research is needed to understand the causal relationship between EWS detection and bipolar episodes. Future research questions could include: What impact does recognition of EWS have on outcome in BD? Does the number of EWS matter i.e. can people with BD effectively manage mood following recognition of only a few EWS? Is the temporal pattern to the detection of signs of relapse important i.e. do people fair better when signs are recognised early opposed to later in relapse?

6.3.2 SRM Cognitive representation -> Interpretation

At the cognitive illness representation stage, people with BD interpreted significantly more positive consequences, less personal control, less comprehensibility, a shorter duration of mood and used more self-dispositional appraisal styles than controls when current mood was controlled for. These findings are in line with previous research assessing illness beliefs in BD (Lobban et al., 2013) and suggest that such beliefs may be important in BD because they may distinguish those who go on to experience more extreme episodes. Indeed, the SRM proposes that interpretations have an influential role over the whole model by guiding coping behaviours, suggesting that the way mood is interpreted in BD will impact on outcome. Lobban et al. (2013) found that illness beliefs in BD did impact on time to relapse and symptoms of BD. The current findings support the idea of illness beliefs being important in BD but require further testing using a prospective design to give support to Lobban et al.'s findings and understand the impact of the beliefs highlighted as important in the current research on outcome in BD.

6.3.3 The addition of Intention

The intention stage of the mood management model was added into the SRM framework to examine whether people with BD report striving for elevated mood due to positive experiences associated with mild hypomania. Although no statistically significant differences were found between people with and without BD in intentions to modify mood, patterns of intentions following positive MI revealed that people with BD were more likely to intend to make mood go higher following positive MI compared to controls. Therefore, the intention stage of mood management deserves further testing with larger samples to examine whether intentions to modify mood differ between people with and without BD. If they do, prospective research is required to examine whether such intentions increase

vulnerability to relapse in BD. If predictions are confirmed then a limitation of the SRM in relation to BD is highlighted; the lack of a box relating to intentions preceding coping.

6.3.4 SRM Coping -> Selection and implementation of coping strategies

To expand the coping box of the SRM, the current research examined the strategies *selected* to cope with mood changes and those *implemented* and found differences between the two. With regard to low mood, people with BD tended to *select* CS likely to exacerbate symptoms of depression but *implement* CS consistent with the self-regulation of low mood and prevention of depression. With regard to high mood, people with BD implemented CS likely to exacerbate symptoms and increase risk of mania. Thus, the current research highlighted a distinction between what people intended to do to manage mood (selection) and what they reported actually doing (implementation) i.e. although people with BD selected strategies likely to decrease symptoms of high mood they reported implementing strategies likely to escalate these symptoms. Therefore, expanding the coping box of the SRM was important and future research should aim to examine coping in BD further to understand how CS selection and implementation differ. Indeed, without distinguishing between the two concepts, we may build a picture of mood management in BD that ignores a tendency to 'run with the high' and implement stimulating CS that may exacerbate symptoms of high mood because what people say they will do is dampen positive emotion but what they actually do is focus on it (positive rumination) and run with it. Future prospective research is needed to understand how the CS selected and implemented impact on outcome in BD.

6.3.5 SRM Outcome appraisal -> Evaluation

Outcome appraisal was assessed in relation to both mood management cycles and the CS used. People with BD were able to evaluate both and evaluated CS for depression as

helpful and CS for mania as unhelpful for managing mood. Coping with depression was consistent with the regulation of mood and prevention of depression but coping with mania was in contrast to the self-regulation of mood and involved implementing CS likely to exacerbate symptoms. The SRM is a "common sense model" which argues that people appraise CS and continue to use the strategies that work. Therefore these results are inconsistent with what the SRM would predict for prevention of mania. People with BD may struggle with the conflict between enjoying elevated mood and employing CS at the optimal time to avoiding an episode of mania or perhaps people with BD do not have, or are unaware of, other options so even though they know the CS are not working they use them anyway because they have to do something. Future research is needed to understand coping with high mood in order to better equip people with BD to manage high mood and reduce the risk of relapse.

6.3.6 SRM Feedback loop -> Repetition

The feedback loop of the SRM could not be accurately tested in the current research due to small sample sizes. Future research should test this stage of the SRM (and the mood management model) with a larger sample of people with BD.

6.3.7 Summary

The SRM proved to be a useful model to understand mood management in BD and allowed comparisons to be made with mood management in a non-clinical sample. This highlighted stages that are important for future prospective research to examine how differences in mood management impact on the course of BD. Findings are summarised in Table 80 below.

Table 80: Summary of How the Current Findings Support and Build on the SRM Framework

SRM Stage	Summary of current findings
Stimulus	Support was found for mood variability and recognition of EWS acting as a stimulus to promote movement through the SRM.
Cognitive representation	Support was found for interpretations being an important part of self-regulation in BD, particularly with regard to interpretations of consequences, personal control, comprehensibility, duration and attribution of cause.
(The addition of intention)	This research built on the SRM framework by including an 'intention' stage. Future research with larger samples is needed to confirm patterns of intentions that suggest that people with BD strive for high mood even after positive MI.
Coping	The coping box of the SRM was expanded and differences were found in the CS people selected and implemented to manage mood. CS selected to mange low more were likely to exacerbate symptoms but CS implemented were likely to prevent depression. CS implemented to manage high mood were likely to exacerbate symptoms and increase risk of mania.
Outcome appraisal	Current findings were inconsistent with the "common-sense" view proposed by the SRM for managing high mood only. Participants themselves rated the most commonly used CS for mania as unhelpful.
Feedback loop	Future research using a larger sample is needed to examine the feedback loop of the SRM in BD.

6.4 The current findings and the other psychological models

The current research only explicitly tested one psychological model (the SRM). However, the findings can be interpreted within the other models of BD (for diagrams see Section 1.3) All models agree that something has to 'trigger' the processes incorporated in the models. In the SRM this is the stimulus box; in the cognitive model a 'critical incident'; in the BAS dysregulation model (Depue & Iacano, 1989; Urosevic et al., 2008) an environmental cue; in the ICS (Bernard (2004; Teasdale & Barnard, 1993) a sensory or affector related change; and in the SPAARS (Jones, 2001; Power & Dalgleish, 1997) and ICM (Mansell et al., 2007) an event. The current research focused on detection of a *mood change* as the trigger and explored mood variability, time to detection and the EWS detected to examine this stage of mood management. Thus, an assumption was made that the stimulus or 'trigger' was a

change in mood. However, whether this is the first trigger for relapse is not known. Indeed, many people with BD report other changes as the EWS of relapse, such as changes in perceptual experiences (e.g. colours seem brighter, sense seem sharper) or changes in levels of energy. Further, detection of a mood change represented a conscious process i.e. one must be aware of a change in mood to report detecting it. However, preceding this stage the 'trigger' (in this case mood change) must be experienced at a subconscious level. In the other models the trigger appears to be at a stage preceding detection i.e. experience/event. Thus, an addition to the SRM (and the mood management model) not explored in the current research would be an experience stage followed by the detection (of the experience/event) stage. This was not tested in the current research due to methodological issues related to the measurement of the experience of a mood change e.g. physiological measures of mood.

A connection between beliefs and emotion is made in all of the models and indeed the current research found that people with and without BD differed in the way mood was interpreted. Specifically, people with BD interpreted more positive consequences, less personal control, less comprehensibility, and used more self-dispositional appraisal styles than controls when current mood was controlled for in analyses. Links can be drawn between these interpretations and the dysfunctional beliefs incorporated into Beck's (1967) cognitive model. Perceptions of less control and understanding along with self-dispositional causal attributions may heighten risk of relapse if activated following detection of a mood change. With regard to the BAS dysregulation model, current findings suggest that efficacy appraisals are low in BD because the ability to personally control mood was perceived to be low. Thus, on experiencing an environmental cue and appraising the cue as relevant to the rewards one seeks, low efficacy appraisals may lead to symptoms of depression because one cannot obtain the rewards they seek. In mania, the BAS dysregulation model suggests that an overactive BAS produces excessive motor behaviours, reward motivations and heightened levels of affect following a positive experience. If people with BD are more sensitive to

positive experiences due to more sensitive regulatory systems, this could explain why people with BD reported significantly more positive consequences related to current mood than controls. Additionally, this theory suggests that people with BD have a biological vulnerability to mood episodes resulting from dysregulation of a neurobiological motivational system (the BAS). Thus, if the cause of mood episodes is neurobiological then the internal attributions made regarding the cause of current mood in this research are explained. In the ICS these interpretations would be held in the propositional subsystem and would have an impact on the schematic model formed in the implicational subsystem. For example, following the input of a downward change in mood interpretations of a lack of personal control, a lack of understanding and self-dispositional attributions of cause may form the schematic model 'depressive episode'. These interpretations then continually feed into the implicational subsystem, strengthening the schematic model. Following an upward mood change at the analogical level, the SPAARS would predict that these interpretations, learned from previous experiences, would be automatically activated at the associative level and additionally feed into the creation and appraisal of future experiences. At the schematic model level, a positive model of hypomania may set up and amplify positive feedback loops through the system. At the propositional level, propositions such as 'I feel good, creative, attractive..' form part of the positive feedback loop that maintains and amplifies the initial change at the analogical level (upward change in mood). The output from either the schematic model or associative level will consequentially be high mood. In the ICM a change in internal state is interpreted in a way that implies extreme positive and negative personal meaning e.g. imminent catastrophe, a personal success, or a personal weakness. Appraisals of extreme personal meaning trigger personal efforts to control internal states through ascent and descent behaviours which paradoxically escalate initial symptoms. If people with BD are striving for immediate personal control over mood then perhaps they are setting the bar for personal control higher than healthy controls and therefore interpretations of a lack of

personal control in BD found in the current research could be attributed to extreme emphasis put on control in the first place.

Additionally, with regard to coping, the ICM proposes two types of CS: ascent behaviours and descent behaviours. Ascent behaviours (e.g. increased involvement in activities, risk-taking, alcohol and substance use, extended wakefulness, seeking social stimulation and dismissal of attempts by others to moderate behaviour) increase the activation level of the internal state and escalate symptoms. Descent behaviours (e.g. social withdrawal, extended sleep, rumination and self-critical thinking) decrease activation levels, contributing to a lowered mood state. Results from the current research suggest that people with BD *select* descent behaviours (i.e. negative rumination and dampening of positive emotions regardless of MI condition) that might exacerbate symptoms of depression but *implement* adaptive strategies to cope with low mood not captured by Mansell et al.'s (2007) ascent or descent behaviours. When trying to manage mania, people with BD implemented ascent behaviours which they themselves deemed unhelpful for managing elevated mood. Thus, the ICM can be used to explain the current findings with regard to relapse into mania, but not relapse into depression.

Finally, in the SRM outcome is appraised, a concept not mentioned specifically in the other models. A feedback loop then sends information back through the whole system. Other than the linear cognitive model and the BAS dysregulation model, all the other models incorporate some form of feedback but none of them have been specifically studied previously. Further, no conclusions could be drawn from the examination of the feedback loop of the SRM (the repetition stage of the mood management model) explored in the current research due to a lack of variability in the data and low counts for the majority of CS.

6.4.1 Summary

The current findings give support to the other psychological models, particularly with regards to interpretations being important for risk of relapse. All of the models make a connection between beliefs and emotion in BD and the current research found that people with BD interpret more positive consequences, less personal control, less comprehensibility, and used more self-dispositional appraisal styles than controls when current mood was controlled for. These findings can be interpreted within, and give support to, the other models of BD (see above). With regard to the ICM, the current findings not only support the idea of personal control being important in BD but also provide evidence for the implementation of ascent behaviours to cope with high mood. Ascent behaviours increase activation levels and provide an account for why people with BD experience manic episodes. However, the current research did not support the idea of descent behaviours being important in depression as proposed by the ICM. Rather, people with BD reported implementing strategies likely to elevate depressive symptoms not exacerbate them.

6.5 Implications of findings for treatment

The current research found differences between people with and without BD in the way in which they manage mood despite the use of psychiatric medication in the bipolar sample. This research highlights the need for future testing of the causal relationship between mood management processes in BD and risk of relapse through prospective research in clinical settings. BD is a complex disorder and as such the effectiveness of treatment may depend on its ability to target specific problems within the cycle of mood management such as interpretations of low personal control and understanding, internal attributions for depressive and hypomania symptoms and the use of potentially maladaptive CS (see below for details). By pinpointing the stages at which people with BD differ in the mood management process from people without a history of mental health problems, future

research can be guided to these particular stages to assess causality with the ultimate aim of increasing the ability of people with BD to self manage mood. The following section highlights the main implications of the current findings for the treatment of BD. It should be acknowledged that any definitive conclusions based on these findings are subject to confirmation of the effects found in future research following a formal power calculation and assessment of causality including the impact of psychological treatment on outcome.

An important implication of the current research is that the use of ESM allowed demonstration of findings in real life settings that have generally only been studied previously in research environments. The current results suggest that even in normal, everyday life, when current mood is not particularly high or low, people with BD still experience significantly more variability in mood and, perhaps accurately, also interpreted a shorter duration of current mood state than people without BD. Managing minor fluctuations in daily life may be as important as managing more extreme mood changes because these fluctuations may be hard to live with and, as this research showed, may also impact on how mood is interpreted and the strategies employed to manage mood in BD.

Although people with BD are able to detect EWS of depression and mania, they reported only monitoring for these signs occasionally. During therapy people with BD could be encouraged to monitor for early signs of relapse more frequently and be taught to recognise common EWS for mania and depression while also exploring idiosyncratic signals in order to create an individualised plan of mood management. If people with BD can effectively monitor for, and identify, EWS early in the prodromal stage, effective CS can be implemented early to reduce the risk of relapse (Colom et al., 2003; Lam et al., 2003; Lobban et al., 2010; Perry et al., 1999). However, an important issue to consider when teaching people to recognise and respond to EWS is the possibility of causing hypervigilance to symptoms resulting in increased anxiety. Results from the current research suggest that people with BD are not hypervigilant to symptoms of depression or mania according to time

taken to detect a mood change and sporadic detection of EWS. However, more research is needed to evaluate the positive and negative impacts, and individual differences, in the benefits and pitfalls of increased monitoring before encouraging clinicians to promote increased monitoring for EWS in therapy. Frequent vigilance to EWS may help some people with BD to stay well but for others may lead to negative consequences such as anxiety.

The current research also found a temporal pattern in detection of warning signs for depressive and manic relapse with some signs recognised early and others at later stages of relapse. In some cases, services do not intervene until a person with BD has reached crisis point. However, if future research reveals a positive association between signs recognised early (opposed to later in relapse) and a reduction in relapse rate then the need for early intervention (once the first signs of relapse are recognised) to curtail an impending episode will be highlighted. This may require services to adapt in ways that facilitate early responses to EWS, rather than crisis responses to relapses. It also offers opportunities to involve relatives and close friends who are often the first to notice EWS, though care needs to be taken to do this in a way that facilitates supportive relationships and does not exacerbate controlling or intrusive interpersonal dynamics.

In addition to focussing interventions on detection of mood changes and future research on the patterns of detection, the importance of attention to the stages of mood management that follow detection, in order to promote the positive aspects of BD and reduce the risk of relapse, was highlighted. The way in which people with BD interpret minor changes in mood that are typical in everyday life may increase risk of relapse and should therefore be a focus for interventions in BD. Specifically, interpretations regarding personal control, comprehensibility and internal attributions of depressive and hypomanic experiences may impact on outcome in BD. To increase a sense of personal control in BD, treatment interventions should promote self-management techniques that allow people with BD to take control over their lives and emotions to increase a sense of autonomy while

still allowing a collaborative relationship between patient and therapist. In order to increase comprehensibility regarding BD, a formulation of what is happening for an individual could be developed during therapy that makes sense to the individual and provides them with a working model to manage their mood. Additionally, interventions could also promote the positive aspects of BD that were perceived by people with BD in the current research, and acknowledge these positives as a potential factor in ambivalence towards treatment. Psychoeducation provides a structured way to promote self-management, increase control and educate people about BD and psychoeducation has been shown to be effective at reducing relapses in BD (Colom & Vieta, 2006; Colom et al., 2009). Interventions, such as Cognitive Behavioural Therapy (CBT) may also be advantageous in altering maladaptive appraisal styles in BD which attribute blame for both hypomanic and depressed mood to the self rather than external factors.

With regard to coping in BD, what seemed to be the challenge for intervention was the promotion of adaptive strategies to manage high mood. The most commonly implemented CS for mania were related to stimulating behaviours that would likely escalate mood and were therefore contrary to mood management. However, interventions that promote techniques to modify these strategies and promote alternatives that are more consistent with managing mood (stimulation reduction strategies) may not be accepted by people with BD. Periods of elevation pose a particular problem because they can lead to a manic episode if not curtailed which can be dangerous, yet on the other hand such periods can be extremely pleasurable and sought after. Therefore people with BD may struggle with the conflict between enjoying elevated mood and employing CS at the optimal time to avoid an episode of mania. Indeed, the current research highlighted how common it is for people with BD to 'run with the high', suggesting that it may be difficult to resist. Further, people with BD know that the strategies implemented to cope with high mood are unhelpful (they specifically reported this) yet implement them anyway. Perhaps this is due to a powerful pull

to feel good when one experiences elevated mood or a lack of alternative strategies. These issues should be acknowledged and worked into therapy in order to help people with BD manage high mood. Thus, what may be important for therapy is helping people with BD to weigh up the pros and cons of 'going with' high mood and teaching them strategies that may work to moderate elevated mood while giving them control over what they choose to do.

ESM could provide a clinically useful way to help people with BD to explore their own mood management and allow them to distinguish between natural mood fluctuations and mood fluctuations that may indicate risk of relapse. Depp et al. (2010) examined the utility of a mobile intervention which integrated ESM with aspects of psychoeducation for mood management in BD. Personal digital assistants (PDAs) were used to repeatedly assess mood in BD. When participants reported an increase in symptoms a preselected personalised mood management strategy appeared on the PDA. Thus, this procedure incorporated personalised adaptive strategies for mood management and EWS with assessment of mood in real time. Importantly, this procedure resulted in decreased clinician-rated depression and participants felt that this procedure would help them if implemented as a form of intervention.

6.6 Limitations

Despite promising findings and important implications for clinical practice, the results of this research should be interpreted within the confines of several limitations discussed below.

6.6.1 Multiple testing

Due to the fact that there were several hypotheses, multiple statistical tests were conducted which increased the chance of Type I error (finding an effect when one does not exist). Type I error was increased because performing tests at the $p<0.05$ level means that

for every 100 tests 5 tests would show a false positive. However, multiple testing was not corrected for by methods such as Bonferroni correction because this research was exploratory. Type I error is not considered as problematic as Type II error (falsely accepting the null hypothesis thus, missing an effect that exists) in exploratory research as described here and was considered a risk worth taking to ensure that effects that existed were not missed. If existing effects were missed then they would be unlikely to be systematically studied in the future and the aim of this research was to highlight stages of mood management most important for systematic testing in future research. Thus, the current findings should be interpreted as preliminary and conclusions drawn based on the effects found were not definitive and require further testing.

6.6.2 Power

No formal power calculation was conducted prior to this research because no specific differences between groups were identified as being of clinical interest; rather the aim was to explore different patterns of behaviour across all of the mood management stages. Additionally, Study 3 used a predetermined sample from the PARADES RCT and with regards to studies 1 and 2, no previous research has used the current methodologies with all of the current measures associated with each stage, therefore a meta-analysis combining the effect sizes from previous studies to estimate the population effect size was not possible. With specific regard to ESM, power calculations are very complex due to the multilevel structure of the data requiring samples sizes at all levels to be considered i.e. at the participant level the number of participants and at the observation level the number of observations per participant. Few studies using multi-level data have conducted formal power calculations prior to data collection for this reason (Dedrick et al., 2009) and consequently there is a lack of literature outlining methods for calculating power in ESM studies and little consensus regarding the utility of doing so. Due to no formal power

calculations being conducted, the statistical power may not have been sufficient to reject the null hypothesis for some stages of mood management. Additionally, the majority of the data presented for Study 3 was descriptive, therefore, relationships between variables and the direction and strength of associations require systematic testing. Future research with larger sample and following a formal power calculation is needed to confirm the effects found in the current research.

6.6.3 Generalisability and comparability of clinical and non-clinical samples

The control and bipolar samples of participants included in this research were chosen mainly for pragmatic reasons, such as time to recruit and involvement in other studies at Lancaster University. How generalisable these samples are to the populations from which they were drawn is therefore questionable. With regard to the bipolar sample, the majority of participants were female, average age 45 years, unemployed, married/cohabiting, living with a partner and British (see Table 81). The mean age of the bipolar samples in the current research were similar to those reported previously in large cohorts (n=1000-3000) of people with BD (Kogan et al., 2004; Kupfer et al., 2002). Additionally, unemployment rates in BD have been reported to be high (2002; Morselli et al., 2004) and difficulty with employment is common in BD (Gilbert & Marwaha, 2013). Little difference has been reported between the number of people with BD who were married/cohabiting or single (Kogan et al., 2004; Suppes et al., 2001), but BD may be higher in people who are separated/divorced (Merikanages et al., 2007). The ethnicity of the current sample was representative of the general population of people with BD (Kogan et al., 2004; Suppes et al., 2001). Thus, the bipolar samples appear to be relatively representative of the general population of people with BD with regards to socio-demographic variables.

Table 81: Bipolar Sample Socio-Demographics

Socio-dem	Study		
	1 (ESM)	2 (MI)	3 (EWS+CS)
Female	62%	52%	58%
Average age	44 years	46 years	45 years
Unemployed	64%	55%	74%
Married/cohabiting	43%	41%	36%
Living with a partner	43%	45%	39%
British	96%	86%	93%

In all 3 studies the majority of people with BD were diagnosed with BD I and were taking some form of psychiatric medication (see Table 82). Prevalence rates of BD I are higher than BD II (APA, 2000) and the majority of people with BD were expected to be taking some form of medication based on previous reports (Kupfer et al., 2002; Suppes et al., 2001). In Study 1 the majority of participants had experienced between 1 and 6 (33%) or 12 and 29 (33%) depressive relapses and between 1 and 6 (hypo)manic relapses (43%). In Study 2 the majority of participants had experienced 30+ depressive (31%) and 30+ hypomanic/manic relapses (34%), and in Study 3 50% of the sample had experienced 20+ relapses therefore these participants may not be entirely reflective of the general population of people with BD (e.g. those with a recent diagnosis or first time episode) but may represent a more chronically unwell sample of people with BD. Thus, it cannot be ruled out that current findings such as perceptions of a lack of control over mood and understanding regarding mood swings in BD may be a *result* of the high numbers of repeated episodes this sample have experienced rather than a *cause* of relapse.

Table 82: Bipolar Clinical Data

Clinical data	Study		
	1 (ESM)	2 (MI)	3 (EWS+CS)
BD I	76%	76%	81%
Taking psychiatric meds	95%	100%	95%

Due to constraints on the recruitment period, bipolar and control samples were not matched on demographics in the group comparison studies (studies 1 and 2) and these studies only included one control group (i.e. healthy controls). Comparisons of people with

BD and individuals with other mood disorders (e.g. unipolar depression) or longer term problems (e.g. Personality Disorder) would be interesting and allow examination of mood management processes specific to BD. While not matching groups on demographic variables such employment provided more generalisable samples because people with BD experience more difficulties regarding employment (Judd et al., 2008), experimental comparisons may be confounded by such group differences. Further, participants with BD were not excluded based on comorbidities or medication status because this represented a more ecologically valid sample. Control participants were not taking any prescribed medication for psychiatric problems in either comparison study therefore medication could have confounded any group differences found by altering mood in the bipolar sample only. However, these studies aimed to examine how mood is normally managed by people with BD and so if taking medication was part of an individual's normal routine then group comparisons should be made regardless of medication use. Results from Study 3 suggest that medication adherence differs depending on whether it is being used to manage depression (consistent adherence) or mania (intermittent adherence). Future research could look at the impact of mood management processes on medication adherence in more detail to assess how the various stages of mood management impact on adherence to medication regimes. Study 3 was constrained by using data already collected as part of the PARADES RCT. Although a number of studies have found no impact of demographic or clinical variables on detection of EWS (e.g. Lam & Wong, 1997; Lam et al., 2001) or coping styles (e.g. Parikh et al., 2007), the demographic and clinical variables related to the PARADES sample were not included in current analyses and therefore future research is required to determine whether these variables had an impact on the detection of EWS and use of CS in the current research.

An additional consideration regarding the generalisabilty of the current findings is that people who volunteer for, and complete, MI and ESM studies may not be representative of the general population from which they are drawn due to personal and environmental

factors which may preclude some people from taking part. For example, ESM is a time-consuming, intensive procedure and therefore social or work commitments may deter some people from participation. Further, the data for Study 3 was drawn from a cohort of participants referred into a 21 week trial of group psychoeducation or peer support for BD. These people may be in some way different from those not motivated to seek help or engage in therapy. However, the sample recruited for the PARADES RCT was recruited from multiple sites and services and only baseline data was used in the current research. None-the-less, observed group differences could have been affected by these issues and so further research is needed to identify the impact of these potential confounds on the current results.

6.6.5 Reactivity

A concern for all research, and in particular for research using ESM, is distortion by reactivity. Reactivity is when the act of assessing a behaviour impacts on the behaviour being assessed (Shiffman et al., 2008) and is therefore akin to the Hawthorn effect (Roethlisberger & Dickson, 1939). However, a number of studies have found little evidence of reactive effects in ESM (e.g. Hufford et al., 2002) and, indeed, the current study found little evidence of reactivity according to reports of how much the study influenced mood.

6.6.6 Self-report and cross-sectional data

Information regarding mood management was gathered through self-report. Even within ESM studies the data is essentially still self-report data and is therefore open to the same limitations associated with self-reports e.g. memory biases. However, using subjective measures to assess subjective states seemed the most appropriate method of investigation and the utility of physiological measures (e.g. heart rate or galvanic skin response) to assess mood is questionable. This research was unable to establish any causal patterns to the

processes involved in mood management due to a cross-sectional design. Even when using ESM, a number of analyses focussed on aggregation of multiple assessments by the same group regarding the same variable over the study week and was therefore cross-sectional in nature. It should be noted that the self-reports in Study 1 were given immediately or very close to when the phenomena occurred and so memory biases were less of a concern. Additionally, aggregating across assessments in ESM studies is suggested to be a more reliable method than one-off assessments due to multiple measurements and also more valid due to avoidance of recall bias and increased ecological validity (Shiffman et al., 2008; Wenze & Miller, 2010). It is important to test causality through prospective intervention studies to examine whether changing any of the variables associated with the mood management stages impacts on relapse in BD.

6.6.7 Current measures

Although ESM has high ecological validity, the validity of the measures used in the current research requires further investigation. In studies 1 and 2, pre-existing measures were adapted, or new measures created, to test current mood. The BIPQ, HIQ, IDQ, RSQ and RPA were all adapted for the current research to ask about state (current mood) rather than trait phenomena. These measures have not been validated as state measures but were used due to lack of availability of state measures. Future research is needed to establish the validity of these measures for assessment of current mood. Additionally, closed-answer questions were presented in Study 2 and 3 to assess the coping stage of mood management and therefore may not have captured all possible mood management strategies utilised by participants. Conversely, Study 1 used an open question format to explore coping in BD. Yet, studying coping still proved difficult overall due to issues around defining what constitutes 'coping'. We all react behaviourally to mood changes and so some of the CS reported in this research may actually be reactions to feeling high or low rather than intentional

implementation of selected CS. For example, the 'avoiding people' item on the CS-D used in Study 3 may be a common response to feeling depressed because low mood makes you feel like avoiding people. Whether an individual would say they were using avoiding people to 'cope' with low mood or experiencing it as a symptom of low mood may depend on how the individual understands the term 'coping'. Additionally, a number of the activities in the daily activities category in Study 1 did not seem to fit with what we might expect to be 'coping' strategies. By asking open-ended questions and asking these questions during a typical week when participants were going about their daily lives, it seems unsurprising that the majority of strategies reported by both groups were synonymous with daily activities. Thus, future research should aim to tighten up the definition of coping to distinguish thoughts and behaviours that are in reaction to altered mood state from strategies employed specifically to manage mood. Additionally, this thesis focussed on mood changes as integral BD. While this may be true (APA, 2000) many people with BD report other changes as important (e.g. perceptual and energy level changes) and this should be acknowledged.

6.7 Future directions

Despite the limitations discussed above, this research has highlighted some important avenues for future research which will be discussed next. Firstly, replicating results following a formal power calculation is important. Using a larger sample, future research could examine the influence of treatment, medication and comorbidities in BD on mood management processes. Future research should also aim to match groups on socio-demographic data and could include a unipolar depressed control group matched on symptomatology to allow examination of mood management processes specific to BD.

With regard to the recognition of EWS, the current findings suggest that this area of research would benefit from future studies exploring the positives and negatives associated with increased monitoring for EWS and the impact of recognition of symptoms associated

with depression and hypo(mania) early (opposed to at later stages in relapse) on outcome in BD.

The current research findings highlighted another potential avenue for future research: the utility of measuring mood at the time of assessment. Without controlling for current mood people with BD appeared to interpret less positive consequences and more concern related to current mood than healthy controls, thus painting a rather negative picture of BD and ignoring the positive aspects of hypomanic experiences and psychological traits associated with BD (Galvez et al., 2010; Lobban et al., 2012; Seal et al., 2008). With increased knowledge of the positives in BD these aspects can be worked into therapy to promote more positive outcomes. However, it should be noted that whether current mood should be controlled for in research regarding mood management in BD is debatable. If we control for current mood state are we, in part, controlling for having BD (i.e. if BD is partly defined by the increased levels of negative affect, by controlling for lower affect in BD we could be artificially increasing scores on the positive aspects)? Is it more meaningful to examine cognitions with or without controlling for current mood? This research was not designed to answer these questions but, as mentioned, has shown the important implications of considering mood at the time of assessment, therefore indicating an important avenue for future research.

If mood at the time of assessment is integral to examining interpretations in BD then perhaps assessments should be taken when people with BD are entering a mood episode because cognitions at this time may be different to those in a euthymic state. All 3 studies only included euthymic bipolar participants. With particular attention to ethical considerations, future studies could examine whether findings are generalisable to the mood management of more extreme mood symptoms to improve knowledge on mood management following the onset of a mood episode. Specifically, using a within-person design future research could explore differences in mood management when people with BD

are entering an episode of BD and when they are not going into episode to understand how processes differ depending on mood state. This could be done using ESM to roll the current procedure out over a number of different mood states and explore in more detail how current mood affects mood management in BD. To date ESM has only been used in two studies of BD which have included symptomatic participants i.e. mildly depressed, currently depressed and currently hypomanic bipolar samples (Depp et al., 2010; Pavlickova et al., 2013). Additionally, prospective research is needed to test causal relationship between mood management processes in BD (e.g. interpretations and coping) and risk of relapse. The majority of this research was cross-sectional and, even using ESM, testing was only conducted over a short period of time (one week). Therefore, comment cannot be provided on how mood management strategies predict relapse in the long term.

Another important implication of the current findings for research is the need to distinguish between what people say they will do to manage mood (selection) and what they actually to do (implementation) to avoid over-emphasising the selection of strategies that are not implemented. If studies fail to make this distinction then participants' answers about strategies implemented may be contaminated with what was *selected* for implementation in the past. For example, although people with BD *selected* potentially maladaptive coping strategies for depression (which increase focus on negative emotion and dampen positive emotion), on further examination of the CS *implemented* it appeared that people with BD moved through the model of mood management in a way that was consistent with the self regulation of low mood. So if people with BD regulate low mood well why do some people experience depression? Not all people with BD experience depression and interestingly no-one involved in the current research experienced a relapse during the study period. Again, a key part of future research should be the use of a within-person design to examine which stages of mood management differ within subjects when mood is managed and when it escalates.

Finally, the measures used in the current research require validation (e.g. the BIPQ, HIQ, IDQ, RSQ and RPA adapted for the assessment of current mood) and the area of 'coping' would benefit from research aimed at defining what constitutes coping and how to effectively examine coping in BD. Additionally, exploration of the relationship between other aspects of BD (other than mood change) and outcome in BD would be interesting and while the potential utility of ESM as a clinical tool was highlighted, future research is needed to confirm ESM as a clinically useful intervention to aid the self management of mood in BD.

6.8 Conclusion

Despite the limitations discussed, this research provides an important step towards highlighting specific stages at which people with and without BD differ in mood management and extends previous research on EWS and CS in BD by using a larger sample and asking participants directly about perceived helpfulness of common CS. Differences between people with and without BD in mood variability, the interpretation of a mood change (specifically regarding personal control, comprehensibility, time-line and cause) and the coping strategies implemented may provide important indications regarding the focus of interventions for BD. Specifically people with BD reported more variability in mood, perceived more positive consequences less personal control, less understanding, a shorter time-line related to mood and made more internal attributions for hypomanic and depressive experiences. Furthermore, while people with BD reported implementing helpful CS to manage low mood, the most commonly used CS for mania were related to stimulating behaviours that would likely escalate mood and were rated as unhelpful by participants themselves. Thus, what may be most important for therapy is helping people with BD to weigh up the pros and cons of going with the high mood and teaching them strategies that may work to moderate elevated mood while giving them control over what they choose to do. These findings have important implications for developing a mood management model based on the SRM to

include the following: a *detection stage* focussing on mood variability and EWS in BD; an *interpretation stage* pertaining to the relevant dimension of the BIPQ used in the current research; an *intention stage* to further examine patterns of intentions to modify high mood; a *coping stage* at which the selection and implementation of CS is distinguished; and an *evaluation stage* relating to the *self*-evaluation of CS. The relevance of a feedback loop (*repetition stage*) was not confirmed but could be the focus of future research. Future research is needed to confirm the effects found in the current research and test whether the differences found play a causal role in escalation of mood into relapse.

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Appendix 1: Music and film pieces used with bipolar samples

Table A1-1: Music Pieces Used in MIPs with Bipolar Samples

Study	Intended mood state	Music pieces
Talbot et al. (2009)	Depression	Adagio from the "Autumn" movement of Vivaldi's *Four Seasons*; "Lullaby" from Stravinsky's *Firebird*; Chopin's Prelude in E Minor, op. 28, no. 4; Faure's Piano Quintet no. 1 in D Minor, op. 89; Faure's Quartet no. 1 in C Minor, op. 15; Rachmaninov's *Vocalise*, op. 34, no. 14; Mahler's Symphony no. 5; Suite no. 1 from Grieg's *Peer Gynt*; and Albinoni's Adagio in G Minor.
	Elation	Allegro and the Rondo from Mozart's *Eine Kleine Nachtmusik*; the Finale from Mozart's Serenade no. 9 in D Major ("Posthorn"), K. 320; the Allegro from Bach's Brandenburg Concerto no. 3; "Waltz of the Flowers," "Trepak," and "Dance of the Flutes" from Tchaikovsky's *Nutcracker*; the Allegro from Dvorak's Piano Quartet in E-flat Major; the Presto from Dvorak's Slavonic Dance no. 1 in C Major, op. 46, no. 1; the Allegretto from Dvorak's Slavonic Dance no. 6 in D Major, op. 46, no. 6; the Allegro from the "Spring" movement of Vivaldi's *Four Seasons*; and Brahms's Hungarian Dance no. 7 in F Major.
Babakhani & Startup (2012)	Depression	'Russia under the Mongolian Yoke' from Prokqiev's 'Alexander Nevsky, Op. 78' played at half speed.
	Elation	Hubert Law's jazz version of Bach's 'Brandenburg Concerto No. 3'.
	Neutral	'Songbird' by Kenny Gee.
Edge et al. (2013)	Elation	A choice of classical (Allegro and Vivace by Handel) or Latin music pieces (Bamboleo and Vamos a Bailar by Gipsy Kings).

Table A1-2: Film Clips Used in MIPs with Bipolar Samples

Study	Intended mood state	Film clips
Wright et al. (2005)	Depression and elation.	Two sets of 3 clips lasting approximately 5 minutes. The clips were selected from 40 collected for use by Newsom-Davis (2004) and were piloted on 5 BD participants who rated their mood level for each clip. The 3 most highly rated for positive and negative mood were selected. Specific clips not reported.
Mansell & Lam (2006), based on Wright et al. (2005)	Depression	Four clips: a clip of a boy pining over the death of his dog (from White Fang), cartoon in which a character is told of the death of their mother (from 'Bambi'), a clip from Kramer Vs Kramer of a child separating from a parent and a woman grieving over her husband's death (from 'Truly, madly, deeply').
	Elation	Four clips: a clip of an attractive landscape focussing on a woman singing and dancing (from 'The Sound of Music'), cartoon of singing, dancing and slapstick comedy (from 'The Jungle Book') scene from 'Only fools and Horses' situation comedy, musical comedy routine from 'The Muppets'.
Lomax et al. (2009)	Elation	3 film/TV clips lasting approximately 6 minutes. Specific clips not reported.
Nutt & Lam (2011)	Depression & elation.	See Wright et al. (2005)
Lomax & Lam (2011)	Elation	See Lomax and Lam (2011)
Gruber et al. (2011)	Depression	Negative clips: Young boy watching father die (170 seconds) and a mother crying over the death of her family (231 seconds).
	Elation	Positive clips: Sarah Hughes winning the Olympic Medal (150 seconds) and Andy Roddick winning the US Open (181 seconds).
	Neutral	Neutral clips: a man and woman doing household tasks (94 seconds) and 2 men sitting quietly in a room (131 seconds).

Appendix 2: Working in collaboration

Table A2-1: Collaborative Working

Study	Description of collaborative working
1 (ESM)	To aid recruitment and reduce burden on participants by collecting data in a single study, myself and two other Doctoral Students (KH and FB) worked collaboratively to collect data for the EMOTE study (Chapter 3). Participants were recruited by myself, KH and FB into an online questionnaire study 'Is mood linked to a good night's sleep?' which aimed to assess the relationship between stability of sleep and activity patterns, appraisal style and mood in BD, healthy controls and Fibromyalgia. Data from this study was not analysed as part of this PhD. The sole use of the online study was to provide a means of screening for potentially eligible participants for EMOTE (Study 1). For this reason my only involvement in the online study was related to recruiting participants (through NHS services, support organisation and the wider community) and selecting eligible participants to contact regarding participation in the EMOTE study. We also worked collaboratively to recruit further participants directly into EMOTE to reach target numbers. EMOTE participants were allocated a researcher (myself, KH or FB) with whom all interviews and appointments took place. Thirty pre-screens, study appointment and debriefs were conducted by myself, 34 by KH and 36 by FB. The ESM diary contained items relevant to the current thesis, along with items relevant to KH and FB's PhD theses, one of which examined the interaction between BD and anxiety and the other which explored the role of circadian rhythms/appraisal styles in BD. The majority of the items included in the diary which related only to the other theses asked for contextual information (e.g. What was I thinking? Where am I? What am I doing?). Therefore, rather than having a negative influence on the items of interest, these items reduced reactivity by disguising the research question and avoiding providing only emotionally salient items.
2 (MI)	The EMOTE study (Study 1) also provided a convenient way to inform participants of the Mood Management study (Study 2, Chapter 4). Participants were asked to give consent to being contacted about Study 2 as part of the written consent to EMOTE. Half of the sample (n=50) for Study 2 were recruited through EMOTE but only 8 of these participants were recruited and interviewed by FB (pre-screen and diagnosis confirmation were done through EMOTE and FB then conducted the appointment for Study 2 following EMOTE debrief) and the rest by myself. To reach target numbers, I recruited further participants (n=50) via NHS services, support organisations and the wider community.
3 (EWS+CS)	Baseline data available from 264 participants recruited across 11 sites in the North West of England and Nottingham into the PARADES Psychoeducation RCT was used in Study 3 (Chapter 5). No additional participants were recruited. I have been employed as a full-time Research Assistant (RA) on the PARADES RCT since 2009 and have collected, input and checked (along with RAs at the 10 other sites involved in the trial) the data used in Study 3. This data was readily available and relevant for the assessment of mood management in BD.

Appendix 3: Final recruitment numbers

Table A3-1: Control Final Recruitment Numbers

Recruited/Excluded	Pre-screen (n=60)	No Pre-screen
Total recruited to study	75	
Total completed study	50	
Excluded due to mental health diagnosis, current treatment or treatment in the last 2 years	8	
Excluded due to significant sleep disturbance	2	
Excluded due to ineligible HPS scores		7
Excluded because the research team were unable to contact the participant		3
Excluded because the participant referred into the study after recruitment numbers met		2

Table A3-2: Bipolar Final Recruitment Numbers

Recruited/Excluded	Pre-screen (n=75)	No Pre-screen
Total recruited to study	116	
Total completed study	50	
Excluded due to being unwell	6	
Excluded due to a brain injury or abnormality	3	
Excluded due to not meeting DSM-IV criteria for bipolar disorder	7	
Excluded due to involvement in PARADES psychoeducation-issue of burden	1	
Excluded because bipolar disorder was not the primary diagnosis	1	
Excluded due to location outside study area	1	
Excluded because the research team were unable to contact the participant	2	2
Excluded because the participant declined taking part due to burden	2	6
Excluded because the participant declined taking part-no reason given	2	2
Excluded because the participant referred into the study after recruitment numbers met		31

Appendix 4: Copy of ESM diary *Figure A4-1: Copy of 1 ESM response A-J*

A

What was I thinking (just before the text alert went off)?

_____

_____

B

	Not			Moderate			Very
Right now I have trouble concentrating	1	2	3	4	5	6	7

C

Please describe your mood just before the text alert went off:

I feel...	Not			Moderate			Very
• cheerful	1	2	3	4	5	6	7
• energetic	1	2	3	4	5	6	7
• confident	1	2	3	4	5	6	7
• anxious	1	2	3	4	5	6	7
• relaxed	1	2	3	4	5	6	7
• worried	1	2	3	4	5	6	7
• bad about myself	1	2	3	4	5	6	7
• down	1	2	3	4	5	6	7
• guilty	1	2	3	4	5	6	7

D

	Not			Moderate			Very
Overall, I'm feeling happy	1	2	3	4	5	6	7

E

My current mood...	Negatively			Not affecting			Positively
• is affecting me at the moment	-4	-3	-2	-1	0	1	2	3	4

My current mood...	Not									Very
• is controllable by me	1	2	3	4	5	6	7	8	9	10
• is causing me concern	1	2	3	4	5	6	7	8	9	10
• makes sense to me	1	2	3	4	5	6	7	8	9	10
• will continue for a long time	1	2	3	4	5	6	7	8	9	10
• was caused by my own behaviour	1	2	3	4	5	6	7	8	9	10

F

I want to make my mood (please underline)...Go up / Go down / Stay the same

I intend to make my mood go up / down / stay the same by (please state the main thing you intend to do)_____

Figure A4-1 continued

G

Right now I am...	**Not at all**	**Somewhat**	**Quite a bit**	**A great deal**
• In high spirits and full of energy	1	2	3	4

I feel like this because...

• I am a talented person with lots to offer	1	2	3	4
• Things happen to be going well for me at present	1	2	3	4

H

Right now I am...	**Not at all**	**Somewhat**	**Quite a bit**	**A great deal**
• Feeling down on myself	1	2	3	4

I feel like this because...

• I am a bad person, even towards myself	1	2	3	4
• Current problems are leading me to be rather hard on myself	1	2	3	4

I

Where am I? (when you received the text alert)_____

Who am I with? (State their relationship to you) _____

In the company of these people, I feel:	**Not**			**Moderate**			**Very**
• Comfortable	1	2	3	4	5	6	7
• threatened	1	2	3	4	5	6	7

J

What am I doing (just before the text alert went off)? _____

_____

Figure A4-2: Copy of final ESM page completed at the end of each day

Please answer the following questions just before you go to bed:

Please note down any events that occurred during today that disrupted your usual activity/routine (e.g. noise, pain, etc.):

- .....
- .....
- .....
- .....
- .....

Please note down any periods when you were not wearing the actiwatch:

From.....**to**..... Reason.....

From.....**to**..... Reason.....

From.....**to**..... Reason.....

From.....**to**..... Reason.....

From.....**to**..... Reason.....

I did not fill in the booklet...

From:.....hrs.....min to:.....hrs.....min. Reason:_____

From:.....hrs.....min to:.....hrs.....min. Reason:_____

From:.....hrs.....min to:.....hrs.....min. Reason:_____

	Not			Moderate			Very
• It was an ordinary day	1	2	3	4	5	6	7
• Filling in the booklet influenced my mood today	1	2	3	4	5	6	7
• Without the watch I would have done other things today	1	2	3	4	5	6	7

The time now is exactly _____

GOOD NIGHT!!

Appendix 5: Mood item correlation

Table A5-1: Control Mood Item Correlations

	Cheerful	Energetic	Confident	Bad	Down	Guilty
Cheerful	1.00	0.65	0.59	-0.23	-0.35	-0.17
Energetic	0.65	1.00	0.58	-0.14	-0.23	-0.08
Confident	0.59	0.58	1.00	-0.25	-0.22	-0.14
Bad	-0.23	-0.14	-0.25	1.00	0.60	0.57
Down	-0.35	-0.23	-0.22	0.60	1.00	0.47
Guilty	-0.17	-0.08	-0.13	0.57	0.47	1.00

Table A5-2: Bipolar Mood Item Correlations

	Cheerful	Energetic	Confident	Bad	Down	Guilty
Cheerful	1.00	0.70	0.79	-0.43	-0.52	-0.37
Energetic	0.70	1.00	0.65	-0.21	-0.32	-0.21
Confident	0.78	0.65	1.00	-0.45	-0.52	-0.41
Bad	-0.43	-0.21	-0.45	1.00	0.79	0.83
Down	-0.52	-0.32	-0.52	-0.79	1.00	0.73
Guilty	-0.37	-0.21	-0.41	0.83	0.73	1.00

Appendix 6: PCA of the HIQ and IDQ

A PCA, with direct oblimin rotation was performed on the HIQ and IDQ separately to extract the items which would assess appraisal types most effectively. Tables 1 and 2 display the statistical output and explanation for the items used in this research. Tables 3 and 4 display for items that loaded most highly on the components and the underlying themes they represented in each measure (see figures 1 and 2 for scree plots).

Table A6-1: PCA Results for the HIQ

Measure	HIQ
Statistical output	The HIQ (*n*=202) had an adequate sample size for PCA (Kaiser-Meyer-Olkin, KMO = 0.73) and correlations between items were sufficient (Bartlett's test of sphericity x^2 (190) = 1256.70, p<0.001). Six components had an eigenvalue over Kaiser's criterion of 1 and together these components explained 63% of the variance.
Explanation for items used	The HIQ items 7a 'I'm a talented person with lots to offer' (HIQ-H) and 7b 'things happen to being going well for me at present' (HIQ-N) were included in the diary because parts a and b loaded highly on *both* an HIQ-H (7a) and HIQ-N (7b) item. Therefore, as a single item, question 7 could assess tendency to attribute the cause of one's mood to the self (positive self-dispositional appraisals: HIQ-H) or external factors (normalising appraisals: HIQ-N) most effectively.

Table A6-2: PCA Results for the IDQ

Measure	IDQ
Statistical output	The IDQ (*n*=208) had an adequate sample size for PCA (Kaiser-Meyer-Olkin, KMO = 0.89) and correlations between items were sufficient (Bartlett's test of sphericity x^2 (190) = 1967.62, p<0.001). Two components had an eigenvalue over Kaiser's criterion of 1 and together these components explained 52% of the variance.
Explanation for items used	The IDQ items 6a 'I am a bad person, even towards myself' (IDQ-D) and 6b 'Current problems are leading me to be rather hard on myself' (IDQ-N) were included in the diary because parts a and b loaded highly on *both* an IDQ-D (6a) and IDQ-N (6b) item. Therefore, as a single item, question 6 can assess tendency to attribute the cause of one's mood to the self (negative self appraisals: IDQ-D) or external factors (normalising appraisals: IDQ-N) most effectively.

Table A6-3: HIQ Components Found by PCA and the Factors that Load on Them

HIQ item	Component					
	1 Positive judgement of self **(HIQ-H)**	2 High external demands **(HIQ-N)**	3 Increased activity levels **(HIQ-H)**	4 Routine disruption **(HIQ-N)**	5 Positive current situation **(HIQ-N)**	6 Hypersensitivity **(HIQ-H)**
1a I'm intelligent and full of good ideas	**0.72**	0.02	0.14	0.11	-0.10	-0.02
1b There are too many competing tasks for me at present	-0.13	**0.74**	0.05	-0.09	0.07	<0.01
2a I'm overdoing it and will soon need a rest	-0.15	**0.65**	0.01	0.04	0.03	-0.39
2b I have more stamina than other people	0.45	-0.12	0.30	-0.09	0.24	0.44
3a I'm full of good ideas and others are too slow	**0.78**	-0.05	0.08	0.18	0.02	0.09
3b There are too many demands on my time	-0.14	**0.75**	0.16	-0.03	-0.07	0.11
4a I'm under pressure from work and social demands	0.20	**0.62**	-0.21	0.05	0.20	-0.20
4b I'm in good spirits and can take on challenges	0.36	-0.05	**0.66**	-0.07	0.23	0.13
5a I'm full of energy and raring to go	0.10	-0.10	**0.84**	0.02	0.09	-0.12
5b There is too much pressure and I need a break	0.30	**0.66**	-0.39	0.03	0.18	0.04
6a I could make rapid decisions and good choices	0.30	0.03	**0.61**	-0.08	-0.13	0.09
6b There are lots of external demands	0.09	**0.60**	-0.14	0.10	0.32	0.13
7a I'm a talented person with lots to offer	**0.72**	-0.03	0.25	-0.30	0.01	0.07
7b Things happen to be going well for me at present	0.03	0.09	0.06	-0.15	**0.81**	-0.02
8a I am a happy, positive and energetic person	0.29	0.30	0.19	-0.76	0.15	0.01
8b Something has disrupted my routine	0.12	0.17	0.02	**0.84**	0.11	-0.01
9a There are few distractions at present	-0.03	0.23	0.05	0.18	**0.72**	-0.07
9b I'm clever and talented	**0.78**	0.02	0.12	-0.13	0.08	0.01
10a It is just a phase and will pass	0.18	0.21	0.21	0.27	0.07	-0.62
10b I'm more sensitive and 'tuned in' than other people	0.21	0.16	0.15	0.21	-0.08	**0.72**

Table A6-4: IDQ Components Found by PCA and the Factors that Load on Them

IDQ item	Component 1 Negative appraisal	Component 2 Normalising appraisal
1a Current pressures are distracting me from my interests	-0.05	**0.58**
1b I don't get pleasure from anything anymore	**0.73**	0.07
2a I am being hard on myself because I am under strain at the moment	-0.24	**0.59**
2b I am a bad person and deserved to be punished	**0.76**	-0.01
3a I am a nasty person	**0.74**	0.03
3b I am under a lot of pressure at the moment	-0.10	**0.70**
4a I am an insensitive person	**0.67**	<-0.01
4b Things are difficult at the moment and I have little energy for other things	0.03	**0.68**
5a I am rather low at present but when things improve the thoughts will go*	**0.85**	0.03
5b I am a worthless person to have these types of thoughts**	-0.17	**0.68**
6a I am a bad person, even towards myself	**0.83**	0.07
6b Current problems are leading me to be rather hard on myself	-0.10	**0.78**
7a Situations look bleak, but will change as things improve*	**0.64**	0.13
7b I am a negative, pessimistic person**	-0.17	**0.57**
8a I am a weak, pathetic person	**0.74**	0.16
8b My difficulties have affected me just at the moment	-0.12	**0.71**
9a I am a failure and a burden to others	**0.84**	0.09
9b Things are going wrong for me just at present	0.03	**0.71**
10a Too many obstacles are being put in my way at present*	**0.71**	0.23
10b I struggle to get anything right in my life**	-0.01	**0.64**

*Items designed to asses normalising self-appraisals but loaded positively on the negative self-appraisal factor.

**Items designed to assess negative self-appraisals but loaded positively on the normalising self-appraisal factors.

Figure A6-1: HIQ scree plot

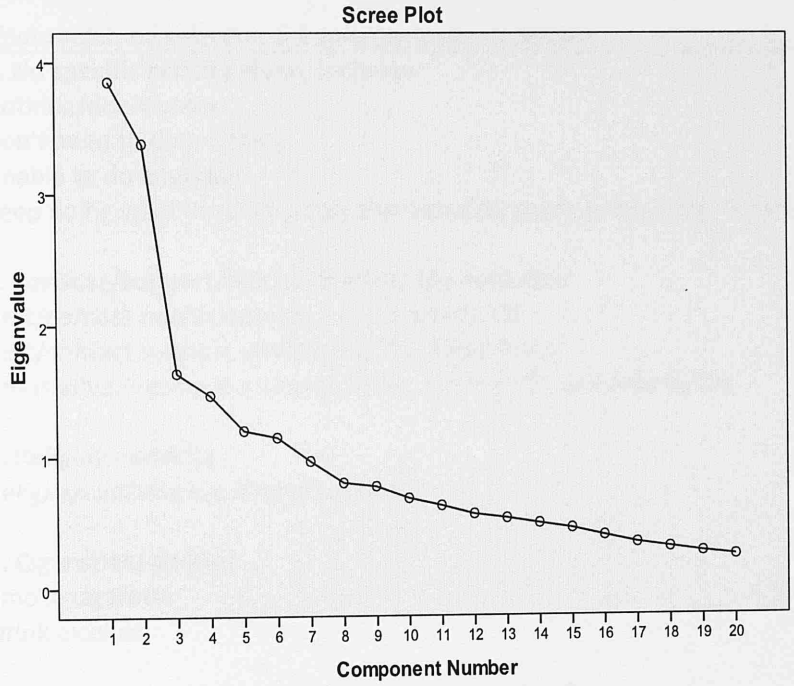
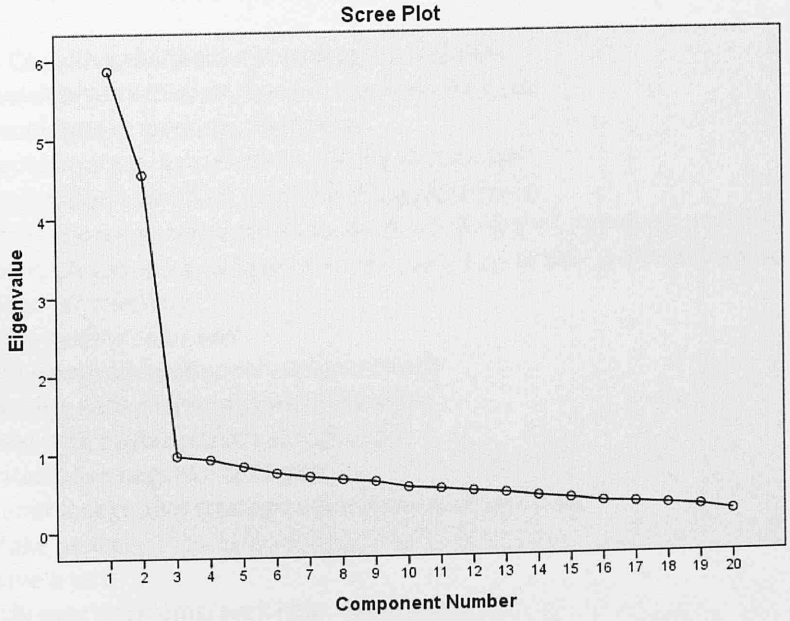


Figure A6-2: IDQ scree plot



Appendix 7: Selection and implementation codebook

Figure A7-1: CS selection & implementation codebook

1. No specific activity given, includes:
Nothing/don't know
Don't need to do anything
Unable to do anything
Keep doing what I'm doing/stay the same/continue as normal (no specific activity given)

2. Services/support/alternative therapy, includes:
Visit/contact health services e.g. GP, psych, CC
Visit/contact support services e.g. AA, Samaritans
Alternative therapy e.g. acupuncture, meditation, self help books

3. Religious activity
Religious activity e.g. Church, pray etc

4. Cigarettes/alcohol
Smoke cigarette
Drink alcohol

5. Go home/stay at home/reduce contact with others
Go home
Stay at home
Reduced contact with others

6. Cognitive/Behavioural strategies, includes
Avoidance/distraction/control methods, includes:
Avoid/ignore stressors/negativity
Avoidance e.g. Avoid work/thinking about work
Ignore/don't dwell on negative thoughts/anxiety
Distraction e.g. concentrate on work not problems, think about something enjoyable not work, go shopping to take mind off work, nap to take mind off physical pain
Not over-thinking
Keep problems to self
Not worrying/getting stressed/annoyed
Dealing with problems/mood, includes:
Deal with problems/stressors/mood
Rationalise negative thoughts
General cognitive strategies/not otherwise specified
Make peace
Have a rant
Talk over problems/seek help from others
Use my normal coping strategies
Reflect on mood
Positive thoughts/actions, includes:
Laughing/smiling
Reflection/focus on positives/positive thoughts
Positive mental attitude e.g. Stay positive, cheerful, I'm good enough etc
Be positive to others/help others

Figure A7-1 continued...

7. Take medication, includes:
Take medication (unspecified)
Take medication for physical pain/problems
Take psychiatric/sleeping medication
Sort out medication

8. Leave/finish work

9. Breaks/relax, includes:
Take a/regular break(s)
Relax/keep calm/rest
Time to myself
Reduce activity/ take on less/ slow down/take things slowly
Breathing exercises/deep breathes
Relaxation exercises
Balance of activity

10. Sleep
Sleep/nap/go to bed/early night

11. Daily/leisure activities and work, includes:
Active leisure e.g. Computer games, poetry, painting, blackberry picking, theatre, restaurant
Read/listen to music/watch TV or film
Watch comedy/listen to happy music
Daily activities e.g. Getting dressed, bank, toilet, food shopping etc / household chores e.g. vacuum
Have a bath/shower
Daily activities-achievement e.g. finding/remembering/fixing something/find out info.
Funeral
Cooking/eating/takeaway/drink (non-alcohol)
Be conscious of food/diet
Child care (routine/daily activities rather than for pleasure e.g. discipline, school run etc. Playing/leisure should be coded 12)
Work/study including meetings for work
Shopping (leisure) including booking holiday
Shopping (no specified leisure/food)
Reduce caffeine/drink water
Increase caffeine-drink coffee/red bull
Wake up/stay awake
Getting up/getting up early
Take care of physical appearance
Physical comfort/health e.g. Get warm, get cool, deal with physical pain

12. Social interaction, includes:
Social interaction including meeting friends, parties, phone calls, doing something with friend/family
Quality time with children/grandchildren/nephew/niece etc (any age) i.e. leisure (non-essential activity e.g. playing)
Interaction with pets
Physical interaction e.g. Hug, sex

Figure A7-1 continued....

13. Productivity and planning, includes:
Be productive/get things done/finished/being focussed, motivated
Planning, decision making, organising and preparation for later event
Maintain routine, regime / stick to plans (refers to general daily routine rather than current task)

14. Change, includes:
Change environment/task
Change lifestyle
Change mood/attitude
Change medication

15. Exercise/activity, includes:
Keep busy/active
Exercise, including walking of any kind (e.g. to shops, dog walk etc)
Find energy

16. Enjoyable activity, includes
Enjoy current (or future) day/activity (if specific activity is given code for that instead)
Looking forward to enjoyable activity
Treat self/do something for self
Achievement / positive feedback

17. Nature, includes:
Fresh air/nature/sunshine/view

18. Cannot code, includes:
Intention given but no strategy
Statement rather than strategy
Reflect on event (no positive/negative valance given)

Appendix 8: ESM eligible and ineligible sample description and analysis

There were significant differences between eligible and ineligible bipolar samples in living arrangements only with nearly half of the eligible sample living with a partner compared to only a quarter of the ineligible sample. Therefore, it is possible that compliance with the ESM procedure was associated with living arrangements. This would need testing in future research.

Table A8-1: Comparison of the Eligible and Ineligible Bipolar Samples

Descriptive	Bipolar eligible (n=42)	Bipolar ineligible (n=8)	Test statistic	df	MD	p-value
Gender ratio (M/F)	16/26	5/3	X^2=1.64	1		0.20
Age, mean (SD)	43.95 (12.74)	39.75 (12.16)	t=0.86	48	4.20	0.39
Highest level of education, n (%)			X^2=1.62	1		0.44
Secondary	11 (26%)	2 (25%)				
Further	12 (29%)	4 (50%)				
Higher	19 (45%)	2 (25%)				
Employment status, n (%)			X^2=1.30	5		0.94
Working (Paid PT/FT)	15 (36%)	3 (38%)				
Not working	27 (64%)	5 (63%)				
Marital status, n (%)			X^2=10.38	5		0.07
Single	15 (36%)	4 (50%)				
Married/Cohabiting	18 (43%)	2 (25%)				
Separated/Divorced/Widow	9 (21%)	2 (25%)				
Living arrangements, n (%)			X^2=16.52	7		0.02
Partner with/without others	18 (43%)	2 (25%)				
Alone	15 (36%)	3 (38%)				
Other	9 (21%)	3 (38%)				
Ethnicity, n (%)			X^2=5.84	3		0.12
British	38 (90%)	7 (88%)				
Other	4 (10%)	1 (13%)				
BD I or II			X^2=2.38	1		0.12
I	32 (76%)	8 (100%)				
II	10 (24%)	0 (0%)				

BD I with mood congruent psychosis			X^2=0.72	3		0.87
No	13 (31%)	3 (38%)				
Yes	29 (69%)	5 (63%)				
Co-morbid Axis I diagnoses			X^2=1.90	2		0.39
No co-morbid diagnosis	9 (21%)	4 (50%)				
Current additional Axis I disorder	25 (60%)	3 (38%)				
Past additional Axis disorder	8 (19%)	1 (13%)				
Age of BD diagnosis, mean (SD)	31.62 (12.01)	30 .13 (11.01)	t=0.33	48	1.49	0.75
No. of days since last episode, mean (SD)	364.55 (583.66)	590.25 (1112.02)	t=-0.85	48	-225.70	0.40

Appendix 9: Patterns of missing selection and implementation data (ESM)

Only 7% more intention stay-the-same responses from the sample who missed the selection item, and 2% more from those who missed the implementation item, compared to the sample who responded to the intention item. This indicates that control participants were not more likely to miss this item because their intention was to stay-the-same but that the percentage of missing data was higher for control participants who intended to stay-the-same because more people had this intention. The bipolar sample showed a more even spread of missing responses across intention to stay-the-same and go up.

Only 7% more 'medium mood' responses from the sample who missed the selection item, and 3% more from those who missed the implementation item, compared to the sample who responded to the current mood item. This indicates that control participants were not more likely to miss this item because their mood was medium but that the percentage of missing data was higher for control participants in a medium mood because more people were in this mood state. A similar pattern was found in the bipolar sample. However, patterns indicated that bipolar participants were more likely to miss the implementation question if they were in a medium mood. The implications of these findings will be discussed.

Table A9-1: Frequency of Selection (T1) Missing Data Depending on Intention (T1)

Intention	Control missing	Bipolar missing
Stay same	155 (76%)*	57 (34%)
Down	1 (0%)	1 (0%)
Up	37 (18%)	56 (33%)
Intention response missing	11 (5%)	55 (33%)
Total	204	169

* not very different from the total percentage of 'stay the same' responses (69%)

Table A9-2: Frequency of Implementation (T2) Missing Data Depending on Intention (T1)

Intention at T1	Control missing	Bipolar missing
Stay same	248 (67%)	83 (45%)
Down	2 (1%)	1 (1%)
Up	114 (31%)	69 (38%)
Intention response missing	4 (1%)	31 (17%)
Total missing	368	184

* not very different from the total percentage of 'stay the same' responses (69%)

Table A9-3: Frequency of Selection (T1) Missing Depending on Current Mood (T1)

Current mood	Control missing	Bipolar missing
Low	3 (1%)	53 (31%)
Medium	154 (75%)*	89 (53%)**
High	46 (22%)	25 (15%)
Current mood response missing	1 (<1%)	2 (1%)
Total	204	169

* not very different from the total percentage of 'medium' responses (68%)
** not very different from the total percentage of 'medium' responses (58%)

Table A9-4: Frequency of Implementation (T2) Missing Data Depending on Current Mood (T1)

Current mood at T1	Control missing	Bipolar missing
Low	2 (1%)	34 (18%)
Medium	260 (71%)*	128 (70%)**
High	105 (29%)	20 (11%)
Current mood response missing	1(<1%)	2 (1%)
Total missing	368	184

* not very different from the total percentage of 'medium' responses (68%)
** does differ from the total percentage of 'medium' responses (58%)

Appendix 10: Selection and intention according to intention and current mood (ESM)

Participants in a *low/high* mood intending to go *up* tended to select and implement daily activities. Bipolar participants in a *high* mood intending to go *down* also tended to select and implement daily activities. Only 2 control participants in a *high* mood intended to go *down* and selected/implemented taking a break/relaxing and daily activities. Only 1 bipolar participant in a *low* mood intended to go down and selected taking a break/relaxing.

Table A10-1: Coping Strategies Selected Depending on Mood and Intention

Coping strategy	Current mood LOW, intention to go UP		Current mood LOW, intention to go DOWN		Current mood HIGH, intention to go UP		Current mood HIGH, intention to go DOWN		Total responses
	Control	*Bipolar*	*Control*	*Bipolar*	*Control*	*Bipolar*	*Control*	*Bipolar*	
Therapy	0	3 (2%)	0	0	0	1 (2%)	0	0	*32*
Religion	0	2 (1%)	0	0	0	3 (7%)	0	0	*22*
Cig/alc	1 (2%)	0	0	0	1 (2%)	1 (2%)	0	0	*28*
Stay at home	6 (10%)	10 (6%)	0	0	1 (2%)	3 (7%)	0	0	*111*
Cog /beh	8 (13%)	13 (8%)	0	0	0	3 (7%)	0	0	*169*
Medication	1 (2%)	4 (3%)	0	0	0	0	0	0	*48*
Work	2 (3%)	0	0	0	1 (2%)	0	0	0	*38*
Breaks/relax	7 (11%)	24 (15%)	0	1 (100%)	4 (7%)	2 (4%)	1 (50%)	2 (13%)	*487*
Sleep	6 (10%)	19 (12%)	0	0	6 (10%)	0	0	4 (25%)	*287*
Daily act.	23 (38%)	47 (30%)	0	0	26 (45%)	16 (35%)	1 (50%)	8 (50%)	*1484*
Social	3 (5%)	14 (9%)	0	0	6 (10%)	6 (13%)	0	1 (6%)	*311*
Productive	0	10 (6%)	0	0	7 (12%)	3 (7%)	0	0	*281*
Change	1 (2%)	2 (1%)	0	0	0	0	0	1 (6%)	*24*
Exercise	2 (3%)	8 (5%)	0	0	5 (9%)	6 (13%)	0	0	*265*
Enjoy	0	1 (1%)	0	0	1 (2%)	2 (4%)	0	0	*120*
Nature	1 (2%)	0	0	0	0	0	0	0	*43*
Total	*61*	*157*	*0*	*1*	*58*	*46*	*2*	16	*3750*

Table A10-2: Coping Strategies Implemented at T2 Depending on Mood and Intention at T1

Coping strategy	Current mood LOW, intention to go UP		Current mood LOW, intention to go DOWN		Current mood HIGH, intention to go UP		Current mood HIGH, intention to go DOWN		Total responses
	Control	*Bipolar*	*Control*	*Bipolar*	*Control*	*Bipolar*	*Control*	*Bipolar*	
Therapy	0	3 (2%)	0	0	0	1 (2%)	0	0	*25*
Religion	0	3 (2%)	0	0	0	3 (7%)	0	0	*18*
Cig/alc	0	0	0	0	1 (3%)	0	0	0	*32*
Stay at home	2 (6%)	2 (1%)	0	0	1 (3%)	1 (2%)	0	0	*35*
Cog/beh	2 (6%)	5 (4%)	0	0	1 (3%)	3 (7%)	0	0	*74*
Medication	0	5 (4%)	0	0	0	0	0	0	*48*
Work	3 (8%)	2 (1%)	0	0	1 (3%)	1 (2%)	0	0	*24*
Breaks/relax	1 (2%)	11 (8%)	0	0	1 (3%)	2 (5%)	0	1 (17%)	*174*
Sleep	3 (8%)	13 (10%)	0	0	1 (3%)	0	0	2 (33%)	*161*
Daily act.	14 (39%)	51 (38%)	0	0	15 (48%)	18 (43%)	1 (100%)	2 (33%)	*976*
Social	5 (14%)	19 (14%)	0	0	1 (3%)	3 (7%)	0	1 (17%)	*224*
Productive	2 (6%)	7 (5%)	0	0	2 (6%)	4 (10%)	0	0	*127*
Change	0	0	0	0	0	0	0	0	*4*
Exercise	4 (11%)	10 (7%)	0	0	6 (19%)	6 (14%)	0	0	*187*
Enjoy	0	0	0	0	0	0	0	0	*11*
Nature	0	4 (3%)	0	0	1 (3%)	0	0	0	*37*
Total	*36*	*135*	*0*	*0*	*31*	*42*	*1*	6	*2157*

Appendix 11: MI final recruitment numbers

Table A11-1: Control Final Recruitment Numbers

Recruited/Excluded	N
Total recruited to study	57
Total completed study	50
Excluded due to mental health diagnosis, current treatment or treatment in the last 2 years	6
Excluded due to location outside study area	1

Table A11-2: Bipolar Final Recruitment Numbers

Recruited/Excluded	N
Total recruited to study	57
Total completed study	50
Excluded due to being unwell	1
Excluded due to a brain injury or abnormality	1
Excluded due to not meeting DSM-IV criteria for bipolar disorder	1
Excluded because the research team were unable to contact the participant	1
Excluded because the participant declined taking part-did not want to focus on bipolar	1
Excluded because the participant declined taking part-no reason given	2

Appendix 12: MI computer programme *Figure A12-1: Copy of the questions that appear in the MI computer programme*

Please mark an "X" at the point on the line that best describes the way you feel **at this moment.**

Sad/Depressed/Down	Normal	Happy/High/Manic
-50	0	50
|.....|		

At the moment I feel...

	Not			Moderate			Very
Cheerful	1	2	3	4	5	6	7
Energetic	1	2	3	4	5	6	7
Confident	1	2	3	4	5	6	7
Relaxed	1	2	3	4	5	6	7
Anxious	1	2	3	4	5	6	7
Worried	1	2	3	4	5	6	7
Bad about myself	1	2	3	4	5	6	7
Down	1	2	3	4	5	6	7
Guilty	1	2	3	4	5	6	7

My current mood...

	Negatively			Not affecting			Positively		
is affecting me at the moment	-4	-3	-2	-1	0	1	2	3	4

My current mood...

	Not								Very
•is controllable by me	1	2	3	4	5	6	7	8	9	10
• is causing me concern	1	2	3	4	5	6	7	8	9	10
• makes sense to me	1	2	3	4	5	6	7	8	9	10
• will continue for a long time	1	2	3	4	5	6	7	8	9	10
• was caused by my own behaviour	1	2	3	4	5	6	7	8	9	10

	Not at all	Somewhat	Quite a Bit	A great deal
If I felt in high spirits and full of energy, I would probably think it was because:				
1. I am a talented person with lots to offer	1	2	3	4
2. Things happen to be going well for me at present	1	2	3	4
If I felt down on myself, I would probably think it was because:				
1. I am a bad person, even towards myself	1	2	3	4
2. Current problems are leading me to be rather hard on myself	1	2	3	4

Figure A12-1 continued

Would you like to make your current mood:

Go up

Go down

Stay the same

How do you intend to make your mood go up / go down / stay the same?

Please indicate how likely you are to use each behaviour to make your mood go up / go down / stay the same:

	not at all			very likely
1. hype myself up as much as possible	1	2	3	4
2. withdraw from other people	1	2	3	4
3. Take regular breaks to unwind	1	2	3	4
4. create lots of new stimulating tasks	1	2	3	4
5. become more dependent on others	1	2	3	4
6. do everything faster	1	2	3	4
7. stop and reflect on my own behaviour	1	2	3	4

	not at all			very likely
8. focus on and take in what is going on around me	1	2	3	4
9. be hard on myself	1	2	3	4
10. ignore any attempts by other people to slow me down or stop me	1	2	3	4
11. think ahead a few days or more	1	2	3	4
12. sleep for prolonged periods of time	1	2	3	4
13. think of some possible problems that may lie ahead	1	2	3	4
14. reflect on mistakes repeatedly	1	2	3	4

	not at all			very likely
15. plan and structure my time	1	2	3	4
16. listen carefully to what other people say about my ideas	1	2	3	4
17. stay up after my usual bedtime and get more done	1	2	3	4
18. act immediately on my feelings	1	2	3	4
19. suppress my feelings	1	2	3	4
20. limit my activities	1	2	3	4
21. reason away attempts by other people to persuade me I am wrong	1	2	3	4

Appendix 13: MI eligible and ineligible sample descriptive and analysis

Age was significantly higher in the ineligible sample compared to the eligible sample of control participants. Therefore, it is possible that MI was less successful for older control participants. This would need testing in future research.

Table A13-1: Comparison of the Eligible and Ineligible Control Samples

Descriptive	Control eligible (n=30)	Control ineligible (n=20)	Test statistic	df	MD	p-value
Gender ratio (M/F)	5/25	4/16	X^2=0.09	1		0.76
Age, mean (SD)	33.03 (8.83)	45.35 (11.97)	t=4.15	47	12.32	<0.001
Highest level of education, n (%)			X^2=0.95	2		0.62
Primary	0	0				
Secondary	2 (7%)	3 (15%)				
Further	6 (20%)	4 (20%)				
Higher	22 (73%)	13 (65%)				
Missing	0	0				
Employment status, n (%)			X^2=0.93	1		0.34
Working (Paid PT/FT)	28 (93%)	17 (85%)				
Not working	2 (7%)	3 (15%)				
Marital status, n (%)			X^2=1.60	2		0.45
Single	11 (37%)	1 (5%)				
Married/Cohabiting	18 (60%)	15 (75%)				
Separated/Divorced/Widow	1 (3%)	1 (5%)				
Living arrangements, n (%)			X^2=6.31	4		0.18
Partner with/without others	18 (60%)	15 (75%)				
Alone	5 (17%)	2 (10%)				
Other	7 (23%)	3 (15%)				
Ethnicity, n (%)			X^2=1.55	1		0.21
British	25 (83%)	19 (95%)				
Other	5 (17%)	1 (5%)				

Table A13-2: Comparison of the Eligible and Ineligible Bipolar Samples

Descriptive	Bipolar eligible (n=29)	Bipolar ineligible (n=21)	Test statistic	df	MD	p-value
Gender ratio (M/F)	14/15	13/8	X^2=1.34	1		0.25
Age, mean (SD)	46.48 (10.30)	45.00 (14.82)	t=-0.31	47	-1.13	0.76
Highest level of education, n (%)			X^2=0.27	3		0.97
Primary	1 (3%)	1 (5%)				
Secondary	6 (21%)	5 (24%)				
Further	9 (31%)	5 (24%)				
Higher	13 (45%)	9 (43%)				
Missing	0	1 (5%)				
Employment status, n (%)			X^2=3.56	1		0.06
Working (Paid PT/FT)	13 (31%)	4 (19%)				
Not working	16 (55%)	17 (81%)				
Marital status, n (%)			X^2=0.83	2		0.66
Single	10 (34%)	10 (48%)				
Married/Cohabiting	12 (41%)	8 (38%)				
Separated/Divorced/Widow	7 (24%)	3 (14%)				
Living arrangements, n (%)			X^2=1.52	3		0.68
Partner with/without others	13 (45%)	8 (38%)				
Alone	9 (31%)	7 (33%)				
Other	7 (24%)	6 (29%)				
Ethnicity, n (%)			X^2=0.01	1		0.91
British	25 (86%)	17 (81%)				
Other	4 (14%)	4 (19%)				
BD I or II			X^2=0.001	1		0.98
I	22 (76%)	16 (76%)				
II	7 (24%)	5 (24%)				
BD I with mood congruent psychosis			X^2=5.24	3		0.16
No	11 (40%)	6 (29%)				
Yes	18 (62%)	15 (71%)				

Co-morbid Axis I diagnoses			X^2=0.04	2		0.98
No co-morbid diagnosis	12 (41%)	9 (43%)				
Current additional Axis I disorder	9 (31%)	6 (29%)				
Past additional Axis disorder	8 (28%)	6 (29%)				
Age of BD diagnosis, mean (SD)	32.57 (10.36)	36.11 (14.27)	t=0.99	45	3.53	0.33
No. of days since last episode, mean (SD)	479.07 (714.03)	797.21 (1054.84)	t=1.25	46	318.14	0.22

Appendix 14: EWS questionnaires PCA tables and scree plots

Table A14-1: EWS-D Loadings

EWS-D item	Component									
	1	2	3	4	5	6	7	8	9	10
1: Low energy	**0.51**	**-0.51**	-0.32	0.08	-0.05	0.30	0.05	0.04	-0.19	<0.01
2: Low motivation	**0.59**	**-0.42**	-0.25	0.07	-0.06	0.24	-0.06	0.03	-0.12	0.15
3: Tired	**0.52**	**-0.43**	-0.22	0.19	-0.03	0.06	-0.06	<0.01	0.11	-0.07
4: Ideas slowed	**0.58**	-0.18	-0.07	-0.02	0.04	-0.39	0.08	0.19	0.26	-0.12
5: Difficultly concentrating	**0.56**	-0.12	-0.13	-0.25	-0.10	-0.34	-0.19	0.06	0.09	-0.24
6: Sense duller	**0.44**	-0.22	-0.12	-0.18	0.09	-0.50	0.04	0.10	0.23	-0.13
7: less talkative	**0.47**	-0.19	0.26	-0.16	-0.22	-0.23	0.26	0.13	0.03	0.28
8: Negative thoughts	**0.46**	0.19	0.24	-0.13	**-0.50**	-0.10	0.14	0.16	<0.001	-0.07
9: Loss of interest in activities	**0.60**	-0.21	0.10	-0.10	-0.18	0.16	0.13	-0.20	-0.13	-0.08
10: Loss of interest in people	**0.50**	-0.12	**0.44**	-0.23	0.16	0.20	0.32	-0.25	0.06	0.10
11: Want to be alone	**0.48**	-0.15	**0.42**	-0.18	0.10	0.31	0.17	-0.07	0.02	-0.07
12: Irritable	**0.50**	0.09	0.13	-0.29	0.19	0.22	-0.19	0.20	0.07	-0.37
13: Less interest in sex	**0.50**	-0.09	0.24	-0.05	0.32	0.16	0.01	0.26	-0.09	-0.19
14: Cannot get to sleep	0.29	0.34	**-0.53**	-0.20	0.13	0.17	0.25	0.13	0.01	0.08
15: Interrupted sleep	0.30	0.31	**-0.61**	-0.15	0.14	0.17	0.33	-0.03	<0.01	-0.14
16: Sleeping too much	0.38	-0.21	0.06	**0.54**	-0.24	0.20	0.04	-0.20	0.24	-0.20
17: Feel sad/want to cry	**0.48**	0.22	-0.22	0.15	**-0.40**	0.16	-0.02	0.02	0.08	0.17
18: Disinterest in food	**0.42**	0.04	<0.01	-0.04	0.31	0.05	0.37	-0.13	-0.08	0.20
19: Worrying	**0.61**	0.08	-0.08	-0.24	-0.16	0.10	-0.22	-0.18	0.09	0.31
20: Anxious	**0.61**	0.11	0.01	-0.34	-0.14	0.02	-0.30	<0.01	-0.01	0.25
21: Afraid of going crazy	0.32	**0.45**	0.07	0.11	-0.29	-0.08	-0.06	-0.41	0.17	-0.09
22: Uncooperative	0.39	0.24	0.36	0.10	0.31	-0.24	-0.09	-0.16	0.05	0.03
23: Neglect hygiene/appearance	0.37	0.07	0.07	0.35	0.39	-0.25	-0.07	-0.08	-0.09	0.28
24: Not able to get up in morning	**0.41**	-0.10	0.13	**0.65**	<0.01	0.10	-0.11	0.12	-0.05	-0.08
25: Aches and pains	**0.43**	0.22	-0.17	0.20	0.21	0.13	-0.18	-0.16	0.01	-0.21
26: Cannot face normal tasks	**0.57**	0.07	-0.12	0.23	0.19	-0.18	-0.18	0.03	-0.21	0.18

27: Guilty	**0.43**	0.36	0.04	0.11	-0.12	-0.23	-0.07	0.01	-0.38	0.01
28: Thoughts of suicide/death	0.31	**0.49**	0.06	0.20	-0.13	-0.13	0.37	<0.01	-0.08	-0.29
29: Agitation	**0.54**	0.24	0.01	-0.10	0.08	0.03	-0.18	<0.01	-0.36	-0.12
30: Drinking too much	0.20	0.30	0.08	-0.10	0.12	0.31	**-0.42**	0.18	**0.42**	0.09
31: Using sleeping tablets	0.24	0.23	-0.06	0.31	0.16	-0.01	0.27	0.21	**0.46**	0.23
32: Using street drugs	0.05	0.18	0.24	0.18	-0.19	0.19	0.07	**0.64**	-0.16	0.11

Table A14-2: EWS-M Loadings

EWS-M item	Component								
	1	2	3	4	5	6	7	8	9
1: Emotionally high	**0.43**	-0.32	0.05	-0.07	0.33	-0.06	0.32	<0.001	0.15
2: Ideas flowing too fast	**0.50**	-0.33	0.18	0.09	0.09	-0.25	0.32	0.24	-0.05
3: Difficulty concentrating	0.32	-0.17	**0.61**	0.11	-0.03	-0.09	0.08	0.05	-0.35
4: Senses sharper	**0.50**	-0.26	-0.20	-0.22	**0.44**	0.02	-0.04	-0.21	-0.02
5: Colours brighter	**0.55**	-0.01	-0.05	-0.25	0.28	-0.03	-0.13	-0.30	-0.20
6: More talkative	**0.55**	**-0.44**	-0.11	0.02	0.09	0.09	-0.31	-0.09	-0.06
7: Racing thoughts	**0.58**	-0.34	0.17	-0.01	0.02	-0.28	0.08	0.13	-0.12
8: Feeling creative	**0.47**	-0.36	-0.17	-0.15	0.29	0.09	0.12	0.05	0.16
9: Irritable	0.21	<0.01	**0.49**	-0.04	-0.26	0.26	0.14	**-0.42**	0.18
10: Stronger interest in sex	**0.49**	-0.05	-0.15	0.25	0.02	-0.17	0.21	-0.10	-0.22
11: Feeling religious	0.29	0.05	0.27	0.31	0.18	0.25	0.27	-0.09	-0.10
12: Visual hallucinations	0.30	**0.41**	0.05	0.10	0.39	0.36	-0.27	0.12	-0.05
13: Energy	**0.49**	-0.37	-0.17	-0.02	-0.02	0.20	-0.21	-0.03	-0.09
14: Cannot get to sleep	**0.42**	-0.32	0.30	0.09	-0.14	0.09	**-0.53**	0.03	-0.17
15: Spend money more freely	**0.53**	-0.22	-0.09	-0.06	-0.17	-0.07	-0.16	0.03	0.23
16: Uncooperative	**0.48**	0.15	0.29	-0.13	-0.01	0.25	0.03	-0.22	0.17
17: Feeling in another world	**0.53**	0.22	-0.03	-0.28	-0.01	-0.15	-0.02	-0.12	0.22
18: Thinking thoughts are being controlled	**0.45**	0.39	0.08	-0.27	0.06	-0.29	-0.02	0.24	0.06
19: Bizarre thoughts	**0.55**	0.37	0.16	-0.20	0.03	-0.15	-0.14	0.16	0.14
20: Auditory hallucinations	**0.44**	**0.46**	0.10	-0.27	0.27	0.14	-0.04	0.28	-0.05

21: Disinhibited/outrageous	**0.58**	0.20	-0.17	-0.17	-0.17	0.10	0.24	0.16	-0.10
22: Feeling strong/powerful	**0.56**	0.14	-0.29	-0.17	-0.35	0.26	0.25	-0.11	-0.12
23: Feeling important	**0.57**	0.17	-0.16	-0.21	-0.30	0.27	0.21	-0.10	-0.24
24: Not needing much sleep	**0.45**	-0.23	-0.11	0.16	-0.37	0.18	-0.14	0.30	0.08
25: Involved in many projects	**0.49**	-0.21	-0.07	0.16	-0.17	0.20	0.15	**0.41**	0.34
26: Heavy alcohol drinking	0.37	0.13	0.11	**0.52**	0.15	<0.01	0.02	-0.24	**0.50**
27: Taking street drugs	0.19	0.30	0.01	**0.51**	0.24	0.30	-0.01	0.25	-0.16
28: Reckless pleasure seeking	**0.52**	0.29	-0.10	0.38	0.02	-0.29	0.11	-0.18	-0.18
29: Anxious	0.22	0.08	**0.66**	-0.18	-0.18	-0.10	-0.09	**0.44**	0.03
30: Wanting to party all night	**0.61**	0.23	-0.20	0.21	-0.13	-0.33	-0.22	-0.08	0.07
31: Wanting to take risks	**0.61**	0.26	-0.19	0.29	-0.22	-0.19	-0.14	-0.14	-0.04

Figure A14-1: EWD-D Scree plot

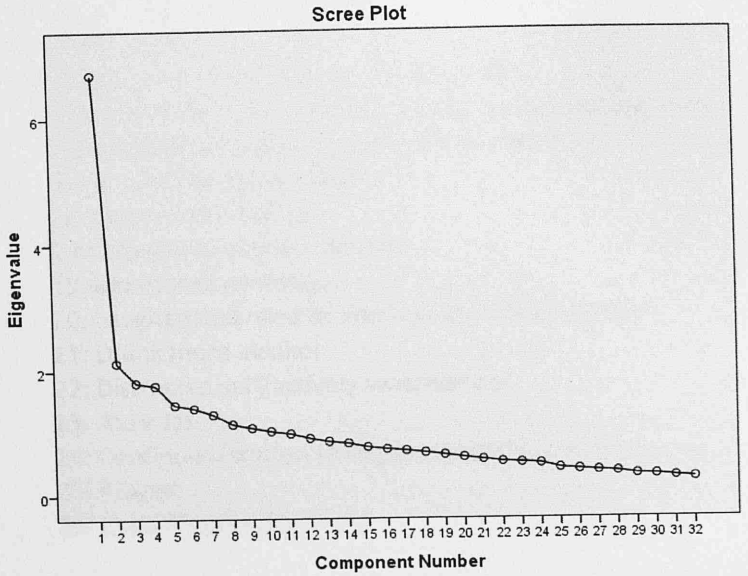
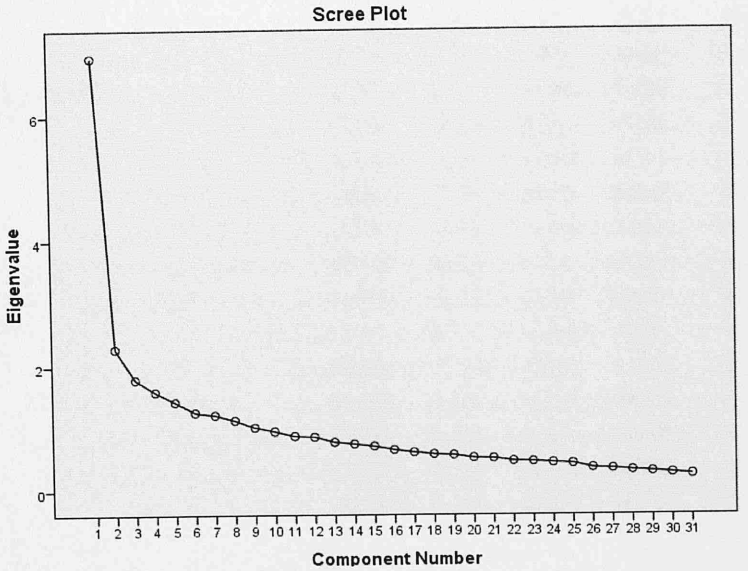


Figure A14-2: EWS-M Scree plot



Appendix 15: CS questionnaires PCA tables and scree plots

Table 15-1: CS-D Loadings

CS-D item	Component					
	1	2	3	4	5	6
1: Sought professional help	**0.57**	0.01	**0.53**	0.10	0.02	-0.35
2: Tried to follow an exercise plan	**0.70**	-0.26	0.05	-0.10	-0.10	0.02
3: Took extra medication w/o prescription	**0.70**	0.26	-0.07	0.06	-0.10	-0.21
4: Stayed in bed	**0.55**	**0.56**	0.11	-0.20	-0.11	0.12
5: Used problem solving strategies	**0.67**	-0.31	0.05	0.28	-0.09	0.13
6: Avoided being with people	**0.56**	**0.49**	0.09	-0.04	0.38	0.13
7: Sought support from trusted relative/friend	**0.61**	-0.05	0.39	-0.02	0.05	-0.26
8: Recognised unrealistic thoughts and evaluated if things were worth worrying about	**0.76**	-0.15	0.03	0.06	0.11	0.22
9: Tired to relax	**0.70**	-0.38	0.02	-0.07	0.11	-0.04
10: Got organised and kept busy	**0.69**	**-0.42**	-0.13	0.08	0.10	0.06
11: Drank more tea/coffee	**0.56**	0.11	-0.05	**0.42**	-0.25	0.15
12: Slept a lot	**0.54**	0.51	0.21	-0.17	-0.15	0.20
13: Cut down on number of things doing	**0.54**	0.30	0.39	-0.06	0.07	0.25
14: Went on as if nothing had happened, hoping that the symptoms would go away	**0.61**	0.16	-0.29	-0.08	0.19	<0.01
15: Established/maintained good daily routine	**0.67**	**-0.44**	0.06	-0.02	0.18	-0.01
16: Daydreamed/fantasised	**0.66**	0.17	-0.30	-0.11	-0.01	-0.08
17: Confronted feelings	**0.66**	-0.24	-0.01	0.23	0.20	0.17
18: Engaged in creative activity	**0.69**	-0.28	-0.18	-0.07	<0.01	-0.11
19: Monitored my mood	**0.66**	-0.25	0.25	0.11	-0.06	0.34
20: Laughed and tried to find humour in the situation	**0.69**	-0.22	-0.24	0.03	0.12	-0.07
21: Drank more alcohol	**0.61**	0.21	-0.33	-0.01	<0.01	-0.12
22: Distracted self/actively switched off	**0.66**	-0.24	-0.02	-0.02	0.14	0.30
23: Ate a lot	**0.61**	0.10	-0.15	-0.23	0.12	0.19
24: Continued/started taking prescribed medication	**0.49**	0.08	0.21	<0.01	0.40	-0.25
25: Prayed	**0.58**	-0.01	-0.14	0.03	-0.26	0.06
26: Used illegal substances	**0.76**	0.16	-0.09	0.18	-0.15	-0.10

27: Smoked more cigarettes	**0.51**	0.26	-0.16	**0.61**	-0.04	0.01
28: Did something for fun/pleasure	**0.79**	-0.25	-0.14	-0.15	-0.05	-0.07
29: Did something reckless/dangerous	**0.72**	0.20	-0.33	0.03	-0.03	-0.16
30: Increased time spent with others	**0.72**	-0.13	-0.01	-0.18	-0.26	-0.15
31: Contacted NHS service	**0.63**	-0.04	0.39	0.28	-0.02	-0.21
32: Sought out an alternative therapy practitioner	**0.76**	0.03	0.06	-0.18	-0.16	-0.03
33: Sought contact with a self help organisation	**0.71**	0.01	0.18	-0.17	-0.17	0.03
34: Read self-help literature	**0.70**	-0.19	0.14	-0.27	-0.16	0.09
35: Did nothing	**0.50**	**0.49**	-0.04	0.15	0.13	0.14
36: Watched TV	**0.55**	0.12	-0.07	-0.12	0.38	-0.05
37: Tried to hurt self	**0.71**	0.21	-0.07	0.03	0.07	-0.18
38: Tried to chat to people on internet chat rooms	**0.75**	0.16	-0.03	-0.03	-0.15	-0.09
39: Took extra work	**0.73**	-0.07	-0.07	-0.16	-0.13	0.04

Table 15-2: CS-M Loadings

CS-M item	Component				
	1	2	3	4	5
1: Sought professional help	**0.51**	-0.36	0.36	0.37	-0.02
2: Tried to monitor and restrain behaviour	**0.63**	**-0.49**	0.31	-0.05	-0.06
3: Reminded myself of a time I was in hospital because of manic depression	**0.64**	-0.24	0.26	0.09	0.08
4: Tired to rest/sleep more	**0.64**	**-0.40**	0.31	0.15	0.16
5: Tired not to act hastily	**0.66**	-0.37	0.26	-0.05	-0.19
6: Avoided being with people	**0.70**	-0.09	0.16	0.12	0.18
7: Sought support from trusted friend/relative	**0.58**	-0.36	0.27	0.19	-0.08
8: Took it out on other people	**0.50**	0.25	**0.56**	0.05	0.36
9: Tried to relax	**0.57**	-0.30	0.29	0.07	-0.30
10: Continued with several activities	**0.62**	0.29	0.12	-0.21	-0.36
11: Tired to recognise and monitor mood	**0.78**	-0.30	-0.08	-0.23	<0.01
12: Said 'stop' to racing thoughts	**0.75**	-0.08	-0.04	-0.28	-0.13
13: Cut down on the number of things doing	**0.84**	-0.16	-0.12	-0.11	0.10

14: Went on as if nothing had happened, hoping that the symptoms would go away	**0.60**	0.35	0.13	-0.36	-0.01
15: Established a good daily routine	**0.71**	-0.17	-0.21	-0.19	-0.09
16: Monitored sleep patterns	**0.76**	-0.26	-0.05	-0.20	<0.01
17: Prioritised things and did minimal essential activities only	**0.79**	-0.14	-0.16	-0.18	0.13
18: Looked out for other hypomanic symptoms	**0.78**	-0.27	-0.09	-0.16	0.14
19: Denied/ignored symptoms	**0.53**	**0.55**	0.28	-0.16	0.04
20: Made sure I did not overwork by having breaks between tasks	**0.74**	-0.17	-0.24	-0.20	0.11
21: Drank more	**0.58**	0.33	0.10	-0.19	0.12
22: Avoided over-stimulation	**0.79**	-0.16	-0.09	-0.22	0.07
23: Tried to reason with self that things were going over the top	**0.81**	-0.22	-0.11	-0.18	-0.03
24: Blamed other people	**0.65**	0.36	0.27	-0.19	0.27
25: Enjoyed the feelings	**0.54**	**0.45**	0.08	-0.15	-0.29
26: Tried to calm myself down by writing down my racing thoughts	**0.75**	0.12	-0.10	0.25	-0.14
27: Followed my instinct and acted accordingly	**0.62**	**0.43**	<0.001	0.21	-0.11
28: Avoided situations in which I might talk too much/inappropriately	**0.83**	0.04	-0.23	0.11	0.07
29: Distracted self/actively switched off from racing thoughts	**0.80**	0.06	-0.23	0.13	-0.12
30: Became irritable and ignored what others said	**0.64**	**0.48**	0.05	0.09	0.16
31: Accepted the symptoms could be the signs of an impending manic episode	**0.73**	-0.10	-0.23	0.26	-0.01
32: Listened to others telling me I was ill	**0.78**	0.08	-0.15	0.28	-0.16
33: Started medication again	**0.44**	0.13	-0.28	0.12	**0.41**
34: Prayed	**0.68**	0.24	-0.08	0.34	0.07
35: Maintained balance or rest and activity	**0.82**	0.05	-0.27	0.15	-0.08
36: Tired to catch up by taking on more	**0.64**	**0.41**	0.09	0.09	-0.30
37: Avoided/reduced environmental stress	**0.79**	-0.03	-0.25	0.11	0.09
38: Prepared myself for the worst outcome	**0.74**	0.08	-0.10	0.18	0.04
39: Did nothing	**0.57**	**0.56**	0.07	0.05	-0.02

Figure 15-1: CS-D Scree plot

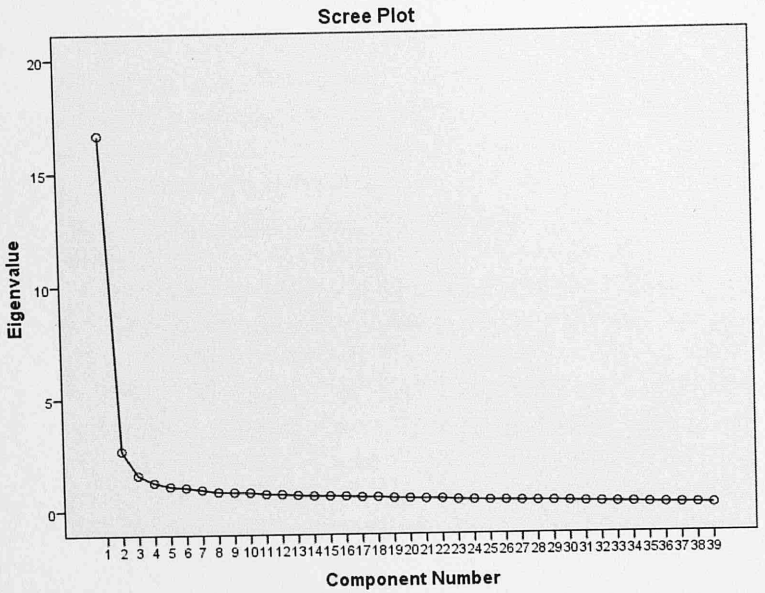


Figure 15-2: CS-M Scree plot