An Investigation of Positive and Negative Sleep Appraisals along the Mood Continuum

A thesis submitted to the University of Manchester for the degree of
Doctor of Philosophy
in the Faculty of Biology, Medicine and Health

2019

Lydia E.M. Pearson

School of Health Sciences, Division of Psychology and Mental Health
# Contents

List of Tables ........................................................................................................................ 13  
List of Figures ...................................................................................................................... 14  
Abstract ............................................................................................................................... 15  
Declaration ........................................................................................................................... 16  
Copyright Statement ............................................................................................................ 16  
Alternative format ................................................................................................................ 16  
Collaborators and authorship ............................................................................................... 17  
Analysis and write-up .......................................................................................................... 17  
Acknowledgments ................................................................................................................ 17  
The author ............................................................................................................................ 18  
1. Introduction ...................................................................................................................... 19  
  1.1. Overview ................................................................................................................... 19  
  1.2. Bipolar Disorder ........................................................................................................ 19  
    1.2.1. Mania and Hypomania ........................................................................................ 19  
    1.2.2. Depression ........................................................................................................... 20  
    1.2.3. Bipolar Spectrum ................................................................................................ 20  
    1.2.4. Familial risk ........................................................................................................ 22  
    1.2.5. Symptom Expression .......................................................................................... 22  
    1.2.6. Hypomanic Endophenotype ................................................................................ 24  
    1.2.7. Bipolar Epidemiology ......................................................................................... 25  
    1.2.8. Bipolar Treatments .............................................................................................. 25  
      1.2.8.1. Pharmacological .......................................................................................... 26  
      1.2.8.2. Psychological .............................................................................................. 26  
      1.2.8.3. Future Directions for Treatment .................................................................. 27  
  1.3. Sleep Disruption ........................................................................................................ 27  
    1.3.1. Biology of Sleep .................................................................................................. 27  
      1.3.1.1. Reward and Circadian Rhythm Dysregulation Model ............................... 28  

1.3.1.1.1. Reward Hypersensitivity Model .......................................................... 28
1.3.1.1.2. Social Zeitgeber Theory ................................................................. 28
1.3.2. Importance of Sleep ................................................................................... 29
1.3.3. Insomnia ..................................................................................................... 30
1.3.4. Hypersomnia ............................................................................................... 31
1.3.5. Reduced Need for Sleep ................................................................................ 31
1.3.6. Shortcomings of Sleep Disturbance Criteria ............................................... 32
1.3.7. Sleep Epidemiology .................................................................................... 32
1.4. Sleep Disturbance Interventions ..................................................................... 33
1.4.1. Transdiagnostic Approach to Sleep .......................................................... 33
1.4.2. Pharmacological Sleep Interventions ......................................................... 34
1.4.3. Behavioural Sleep Intervention .................................................................. 34
1.4.3.1. Therapeutic Light Exposure .................................................................. 35
1.4.3.2. Social and Behavioural Manipulation ................................................... 35
1.4.4. Cognitive Sleep Intervention ....................................................................... 36
1.4.4.1. Cognitive Model of Insomnia ................................................................. 36
1.4.4.2. Cognitive Behaviour Therapy for Insomnia (CBT-I) ............................... 38
1.4.4.2.1. Cognitive Components ..................................................................... 38
1.4.4.2.2. Behavioural Components .................................................................. 39
1.4.4.3. Cognitive Behaviour Therapy for Insomnia in Bipolar Disorder .......... 39
1.4.4.4. The Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS) ....... 40
1.4.4.5. Dysfunctional Sleep Beliefs in BD ......................................................... 41
1.5. Proposal of the Integrative Cognitive Sleep Model ....................................... 41
1.5.1. Missing “Positive Side” .............................................................................. 41
1.5.2. The Integrative Cognitive Model ............................................................... 42
1.5.3. The Hypomanic Positive Predictions Inventory (HAPPI) ......................... 44
1.5.4. An Integrative Cognitive Sleep Model ....................................................... 45
1.6. Conclusion ..................................................................................................... 47
1.6.1. Research Aim 1: Develop a sleep cognition measure that assesses for positive and negative appraisals of excessively short or long sleep durations .......... 47
1.6.1.1. Aim 1.1 / Study 1 .................................................................................. 47
1.6.1.2. Aim 1.2 / Study 2 ........................................................................................ 47
1.6.2. Research Aim 2: Establish initial validity and reliability for this sleep cognition measure ......................................................................................................................... 47
  1.6.2.1. Aim 2.1 / Study 3 ........................................................................................ 47
  1.6.2.2. Aim 2.2 / Study 3 ........................................................................................ 47
  1.6.2.2.1. Hypothesis 2.2.1 ................................................................................... 48
  1.6.2.3. Aim 2.3 / Study 4 ........................................................................................ 48
  1.6.2.3.1. Hypothesis 2.3.1 ................................................................................... 48
  1.6.2.3.2. Secondary hypothesis 2.3.2 .................................................................. 48
  1.6.2.3.3. Secondary hypothesis 2.3.3 .................................................................. 48
1.6.3. Research Aim 3: Use this sleep cognition measure to test the proposed ICSM .48
  1.6.3.1. Aim 3.1 / Study 3 ........................................................................................ 48
  1.6.3.2. Aim 3.2 / Study 5 ........................................................................................ 48
  1.6.3.2.1. Hypothesis 3.2.1 ................................................................................... 49
  1.6.3.3. Aim 3.3 / Study 5 ........................................................................................ 49
2. Methodology .................................................................................................................... 50
  2.1. Overview of studies included in this thesis ............................................................... 50
  2.1.1. Research Aim 1: Develop a sleep cognition measure that assesses for positive and negative appraisals for excessively short or long sleep durations ................. 50
  2.1.2. Research Aim 2: Establish initial validity and reliability for this sleep cognition measure (PANSAM) ..................................................................................................... 50
  2.1.3. Research Aim 3: Use this sleep cognition measure (PANSAM) to test the proposed ICSM ............................................................................................................. 51
  2.2. Developing and validating a measure ........................................................................ 52
  2.2.1. Preliminary Considerations ............................................................................... 52
  2.2.1.1. Aim 1.1 / Study 1: Conduct a scoping review to discover the range of self-report sleep cognition measures discussed in the literature for the sleep disturbances insomnia, hypersomnia, and reduced need for sleep........................................ 52
  2.2.2. Development Process ....................................................................................... 52
  2.2.2.1. Aim 1.2 / Study 2: Conduct a Delphi method study in order to explore and identify expert consensus on positive and negative sleep appraisals in the context of low and high mood states......................................................... 53
  2.2.3. Validating a Questionnaire ................................................................................ 54
2.2.3.1. Validity........................................................................................................ 54
  2.2.3.1.1. Content Validity ................................................................................... 54
  2.2.3.1.2. Construct Validity ................................................................................ 55
    2.2.3.1.2.1. Reduction Analysis ...........................................................................55
    2.2.3.1.2.1.1. Aim 2.1 / Study 3: Explore the factor structure of the sleep
cognition measure ........................................................................................ 55
  2.2.3.1.2.2. Convergent Validity .......................................................................... 55
    2.2.3.1.2.2.1. Aim 2.2 / Study 3: Review the construct validity of the sleep
cognition measure with validated measures representing BD personality,
mood, sleep, and cognitions relevant to both mood and sleep ..................... 55
  2.2.3.1.2.3. Discriminant Validity ........................................................................ 56
    2.2.3.1.2.3.1. Aim 2.3 / Study 4: Test the sleep cognition measure in line
with the ICM by comparing individuals who experience both elevated and
depressed mood states (a BD spectrum group) with two control groups
(unipolar depression group and non-clinical groups) ..................................... 56
  2.2.3.2. Reliability.................................................................................................... 56
2.3. Testing the Proposed ICSM................................................................................. 57
  2.3.1. Cross-Sectional Methodology ...................................................................... 57
  2.3.2. Diary Methodology ...................................................................................... 57
    2.3.2.1. Aim 3.2 / Study 5: Test if the PANSAM predicts a person’s sleep shifting
from short to long duration sleep disturbances, night by night .......................57
  2.3.3. Predictive Validity Tests ............................................................................... 58
2.4. Assessments........................................................................................................ 58
  2.4.1. Mood Assessments ...................................................................................... 58
  2.4.2. Sleep Measures ............................................................................................ 60
  2.4.3. Cognition Measures ...................................................................................... 61
  2.4.4. Anxiety .......................................................................................................... 62
2.5. Samples & Recruitment ..................................................................................... 63
2.6. Ethical Approval ............................................................................................... 63
2.7. Summary ........................................................................................................... 64
sleep duration disturbances ..................................................................................... 65
3.1. Abstract ...................................................................................................................... 67

3.2. Introduction ............................................................................................................... 68
   3.2.1. Purpose of study .................................................................................................. 70

3.3. Methods ..................................................................................................................... 71
   3.3.1. Overview ............................................................................................................. 71
   3.3.2. Research question .............................................................................................. 71
   3.3.3. Identification of relevant studies ......................................................................... 71
   3.3.4. Study selection .................................................................................................... 72
   3.3.5. Charting the data ................................................................................................. 73
   3.3.6. Analysing the data ............................................................................................... 74

3.4. Results ....................................................................................................................... 74
   3.4.1. Study selection .................................................................................................... 74
   3.4.2. Measure characteristics ....................................................................................... 74
   3.4.3. Theory ................................................................................................................. 75
   3.4.4. Item Level ........................................................................................................... 76
      3.4.4.1. Hypersomnia ............................................................................................... 76
      3.4.4.2. Reduced Need for Sleep .............................................................................. 76

3.5. Discussion .................................................................................................................. 77
   3.5.1. Sleep Hygiene ..................................................................................................... 78
   3.5.2. Arousal ................................................................................................................ 78
   3.5.3. Beliefs / Attitudes ................................................................................................. 79
   3.5.4. Control / Self-Efficacy ........................................................................................ 79
   3.5.5. Limitations .......................................................................................................... 80
   3.5.6. Future Research ................................................................................................... 80

4. The development of a theoretically derived measure exploring extreme appraisals of
   sleep in Bipolar Disorder: A Delphi study with professionals ........................................... 109
   4.1. Abstract .................................................................................................................... 111
   4.2. Introduction ............................................................................................................. 112
   4.3. Method ..................................................................................................................... 114
4.3.1. Delphi Method .................................................................................................. 114
4.3.2. Participants ...................................................................................................... 115
4.3.3. Procedure ........................................................................................................... 116
  4.3.3.1. Round 1 ................................................................................................. 117
  4.3.3.2. Round 2 ................................................................................................. 117
  4.3.3.3. Round 3 ................................................................................................. 118
4.4. Results ..................................................................................................................... 118
  4.4.1. Demographics ............................................................................................... 118
  4.4.2. Ratings of Importance Results ...................................................................... 118
4.5. Discussion ................................................................................................................. 122
  4.5.1. Clinical Implications ..................................................................................... 123
  4.5.2. Strengths and Limitations ............................................................................. 123
  4.5.3. Conclusion ..................................................................................................... 124
4.6. Acknowledgments ................................................................................................. 125

5. Initial psychometric validation of the Positive and Negative Sleep Appraisal Measure
   (PANSAM) along the mood and sleep continuum ....................................................... 126
  5.1. Abstract ............................................................................................................... 128
  5.2. Introduction ......................................................................................................... 129
  5.3. Methods .............................................................................................................. 131
    5.3.1. Participants ................................................................................................. 131
    5.3.2. Measures ..................................................................................................... 131
      5.3.2.1. Positive and Negative Sleep Appraisal Measure (PANSAM) .............. 131
      5.3.2.2. Internal States Scale (ISS) (Bauer et al., 1991) .................................... 131
      5.3.2.3. Hypomanic Personality Scale (HYP) (Eckblad & Chapman, 1986) ..... 132
      5.3.2.4. Patient Health Questionnaire – 9 (PHQ-9) (Kroenke, Spitzer, & Williams,
               2001) ............................................................................................................. 132
      5.3.2.5. Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989) ............... 132
      5.3.2.6. Hypomanic Attitudes & Positive Predictions Inventory (HAPPI) (Mansell,
               2006) ............................................................................................................. 132
      5.3.2.7. Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS) (Morin et
               al., 1993) ..................................................................................................... 133
7.3. Method ..................................................................................................................... 170

7.3.1. Participants ...................................................................................................... 170

7.3.2. Design ............................................................................................................. 170

7.3.3. Measures ....................................................................................................... 170

7.3.3.1. Positive and Negative Sleep Appraisal Measure (PANSAM) .................. 170
7.3.3.2. Internal States Scale (ISS) (Bauer et al., 1991) ........................................ 171
7.3.3.3. Hypomanic Personality Scale (HYP) (Eckblad & Chapman, 1986) ..... 171
7.3.3.4. Patient Health Questionnaire – 9 (PHQ-9) (Kroenke et al., 2001) ........ 171
7.3.3.5. Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989) ............... 172
7.3.3.6. Hypomanic Attitudes & Positive Predictions Inventory (HAPPI) (Mansell, 2006) ...................................................................................................................... 172
7.3.3.7. Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS) (Morin et al., 1993) ................................................................................................................. 172

7.3.4. Daily Diary Design and Measures ................................................................. 172

7.3.4.1. Actigraphy ................................................................................................. 172
7.3.4.2. Consensus Sleep Diary .............................................................................. 173
7.3.5. Procedure....................................................................................................... 173

7.4. Results .................................................................................................................. 173

7.4.1. Descriptive Statistics and Preliminary Analysis ........................................... 174
7.4.2. Does the PANSAM predict TST subjective and objective variability? .... 175
7.4.3. What is the incremental validity of the PANSAM with TST subjective and objective variability? ................................................................. 177

7.5. Discussion........................................................................................................... 179

7.5.1. Strengths & Limitations .................................................................................... 180

8. General Discussion ............................................................................................... 182

8.1. Overview ........................................................................................................... 182

8.2. Research Aim 1: Develop a sleep cognition measure that assesses for positive and negative appraisals for excessively short or long sleep durations .................................................. 182
8.2.1. Aim 1.1 / Study 1: Conduct a scoping review to discover the range of self-report sleep cognition measures discussed in the literature for the sleep disturbances insomnia, hypersomnia, and reduced need for sleep ... 182
8.2.2. Aim 1.2 / Study 2: Conduct a Delphi method study in order to explore and identify expert consensus on positive and negative sleep appraisals in the context of low and high mood states ........................................................................................... 183

8.3. Research Aim 2: Establish initial validity and reliability for the PANSAM........... 185

8.3.1. Content Validity ................................................................................................ 185

8.3.2. Construct validity ............................................................................................ 186

8.3.2.1. Reduction Analysis ................................................................................... 186

8.3.2.2. Convergent Validity .................................................................................. 187

8.3.2.3. Discriminant Validity ................................................................................ 187

8.3.3. Internal Reliability ............................................................................................ 188

8.3.4. Test-Retest Reliability ....................................................................................... 188

8.4. Research Aim 3: Use the PANSAM to test the proposed Integrative Cognitive Sleep Model (ICSM) ................................................................................................................ 188

8.4.1. Aim 3.1 / Study 3: Conduct a hierarchical regression to explore the PANSAM’s predictive usefulness with a validated sleep quality measure over age, gender, BD tendency and the commonly used DBAS measure .................................................... 189

8.4.2. Aim 3.2 / Study 5: Test if the PANSAM predicts a person’s sleep shifting from short to long duration sleep disturbances, night by night ........................................... 189

8.4.3. Aim 3.3 / Study 5: Conduct a hierarchical regression to test the incremental validity of the PANSAM on subjective and objective validity, entered following associated variables .................................................................................................... 190

8.5. Unique Contributions of the PANSAM ................................................................ 190

8.6. Comparison with previous ICM research ............................................................. 191

8.7. Clinical Implications ................................................................................................ 192
List of Tables

Table 1. Study 1, Terms used for electronic database search ..............................................72
Table 2. Study 1, Information synthesis of accepted measures .............................................81
Table 3. Study 2, Participant Characteristics .....................................................................119
Table 4. Study 2, High consensus items ..........................................................................121
Table 5. Study 3, PANSAM factor loadings, item endorsement and internal consistencies .................................................................................................................................136
Table 6. Study 3, Pearson correlations between PANSAM factors ..................................138
Table 7. Study 3, Mean & standard deviations for measures & subscales ..........................139
Table 8. Study 3, Pearson correlations between PANSAM factors & additional measures .................................................................................................................................140
Table 9. Study 3, Hierarchical regression output ...............................................................141
Table 10. Study 4, Inclusion & exclusion criteria for each group .......................................152
Table 11. Study 4, Participant clinical characteristics across the groups...........................156
Table 12. Study 4, Participant measure characteristics across the groups ..........................157
Table 13. Study 4, PANSAM subscale mean and standard deviations ...............................159
Table 14. Study 4, PANSAM correlations with mood, sleep and anxiety ............................160
Table 15. Study 4, DBAS correlations with mood, sleep and anxiety ................................160
Table 16. Study 5, Measure descriptive statistics ..............................................................174
Table 17. Study 5, Sleep data descriptive statistics ............................................................175
Table 18. Study 5, Correlations between baseline self-report measures & outcome measures .................................................................................................................................177
Table 19. Study 5, Regression analyses for subjective & objective variability ....................178
List of Figures

Figure 1. Bipolar Spectrum .................................................................................................. 21
Figure 2. Social Zeitgeber Theory (Grandin et al., 2006) .................................................... 29
Figure 3. Cognitive Model of Insomnia (Harvey, 2002a) .................................................... 37
Figure 4. Integrative Cognitive Model (Mansell et al., 2007) ............................................. 44
Figure 5. Integrative Cognitive Sleep Model ....................................................................... 46
Figure 6. Study 1, PRISMA 2009 Flow Diagram ................................................................. 75
Figure 7. Study 2, Number of items included, rerated, and excluded at each round of the study ................................................................................................................................... 120
Figure 8. Study 4, Mean PANSAM scores across the groups ........................................... 159
Figure 9. Study 5, Sleep diary relationship with PANSAM .............................................. 176
Figure 10. Study 5, Sleep actigraphy relationship with PANSAM ................................... 176
Abstract

The University of Manchester
Candidate: Lydia E. M. Pearson
A thesis submitted to the University of Manchester for the degree of Doctor of Philosophy in the Faculty of Biology, Medicine and Health in October 2019
Thesis title: An Investigation of Positive and Negative Sleep Appraisals along the Mood Continuum

This thesis investigated positive and negative sleep appraisals for excessively long and short sleep duration disturbances commonly experienced by those with bipolar spectrum mood swings. Chapter 1 provides a background of the literature and the proposal of the Integrative Cognitive Sleep Model (ICSM). The ICSM is a subset of the Integrative Cognitive Model and proposes that positive and negative sleep appraisals for excessively long and short sleep durations play a key role in the development and maintenance of insomnia, hypersomnia and reduced need for sleep. Specifically, endorsing more of these conflicting appraisals will drive sleep fluctuation. Chapter 1 outlines the aims and hypotheses designed to test this new model while Chapter 2 is a review of the methodologies undertaken in order to achieve the aims and hypotheses. Study 1 (Chapter 3) provides a scoping review of the literature to identify the available sleep cognition measures. This study highlighted a significant gap in the knowledge base since no measures were identified for hypersomnia or reduced need for sleep. Study 2 (Chapter 4) is a Delphi method study with research and clinical professionals in the field of BD to generate appraisal statements for a new measure that will aid in testing the proposed ICSM. The statements generated in Study 2 informed the new Positive and Negative Sleep Appraisal Measure (PANSAM). Study 3 (Chapter 5) is a series of validity and reliability statistical tests to establish initial psychometric robustness for the PANSAM. The results highlighted four expected subscales: positive and negative appraisals for both short and long sleep durations. Study 3 also evidenced good convergent validity with validated measures for mood, sleep, and mood and sleep cognitions. Study 4 (Chapter 6) was a clinical study with participants who met criteria for either bipolar spectrum, unipolar depression or were non-clinical. It was hypothesised the PANSAM would discriminate between all three participant groups, with higher scores for those in the bipolar spectrum group due to their increased vulnerability to mood and sleep disturbances. This hypothesis was only partially supported since there was no statistically significant difference between the clinical groups, but both had statistically significantly higher PANSAM scores than the non-clinical control group. Finally, the ICSM was tested more directly in several different ways. Study 3 (Chapter 5) conducted a hierarchical regression to test the incremental validity of the PANSAM on subjective poor sleep quality, over and above age, gender, bipolar tendency and a commonly used sleep cognition measure for insomnia. The results highlighted the subscale for positive appraisals for sleeping more (representing sleep as a safety behaviour) was significant. To test the ICSM more robustly, Study 5 (Chapter 7) was devised to test the hypothesis that the PANSAM would predict subjective (sleep diary) and objective (actigraphy) total sleep time variability. Additionally, a second hierarchical regression was conducted in this study to test the incremental validity of the PANSAM on the sleep variability variables over and above bipolar tendency and the same commonly used sleep cognition measure for insomnia. The results of Study 5 (Chapter 7) showed the PANSAM was statistically significantly predictive of objective total sleep time variability only but did not uphold incrementally. The findings from these studies suggest the PANSAM offers unique contributions to sleep cognition research. Clinical implications and future research ideas are discussed.
Declaration

I declare that no portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning

Copyright Statement

The author of this thesis (including any appendices and/or schedules to this thesis) owns certain copyright or related rights in it (the “Copyright”) and s/he has given the University of Manchester certain rights to use such Copyright, including for administrative purposes.

ii. Copies of this thesis, either in full or in extracts and whether in hard or electronic copy, may be made only in accordance with the Copyright, Designs and Patents Act 1988 (as amended) and regulations issued under it or, where appropriate, in accordance with licensing agreements which the University has from time to time. This page must form part of any such copies made.

iii. The ownership of certain Copyright, patents, designs, trademarks and other intellectual property (the “Intellectual Property”) and any reproductions of copyright works in the thesis, for example graphs and tables (“Reproductions”), which may be described in this thesis, may not be owned by the author and may be owned by third parties. Such Intellectual Property and Reproductions cannot and must not be made available for use without the prior written permission of the owner(s) of the relevant Intellectual Property and/or Reproductions.

iv. Further information on the conditions under which disclosure, publication and commercialisation of this thesis, the Copyright and any Intellectual Property and/or Reproductions described in it may take place is available in the University IP Policy (see http://documents.manchester.ac.uk/DocuInfo.aspx?DocID=24420), in any relevant Thesis restriction declarations deposited in the University Library, The University Library’s regulations (see http://www.library.manchester.ac.uk/about/regulations/) and in The University’s policy on Presentation of Theses.

Alternative format

This thesis has been presented in alternative format to allow for the continuous dissemination of completed research studies conducted as part of this thesis. The Scoping
Review (Study 1) is being prepared for submission for the Sleep Medicine Review Journal. The Delphi Method Study (Study 2) has been submitted to Behavioural and Cognitive Psychotherapy and amendments for resubmission are being actioned. Study 3 (Initial Psychometric Tests) has been submitted to the Behavioural Sleep Medicine Journal and amendments for resubmission have been received and these need to be action. Studies 4 and 5 are prepared for submission and need to be submitted to relevant journals.

Collaborators and authorship

Supervision related to the design, execution and analysis of studies included in this thesis was provided by Dr. Warren Mansell and Dr. Sophie Parker. Due to this they are included as authors on all papers. Study 1 includes Elizabeth Turner as an author, since she provided guidance on conducting a systematic review and acted as second reviewer for the scoping review.

Analysis and write-up

All data analyses for studies included in this thesis were conducted by the candidate under the supervision of Dr. Warren Mansell and Dr. Sophie Parker. Graham Dunn (statistician) did also provide initial advice for planned statistical analyses and power calculations.

Acknowledgments

I would first like to sincerely thank my supervisors, Dr. Warren Mansell and Dr. Sophie Parker. I have learnt so much from both and am hugely appreciative of all the patience, support and guidance they have provided during my time as their student. In addition, I want to thank Dr. Sophie Parker for providing me the funding opportunity to conduct this PhD. This has been whilst working with her on both the BART and iATTP trials. The support she has given to help me complete this PhD alongside my normal duties has been incredibly helpful. I would also like to thank all of my colleagues at the Psychosis Research Unit who have been a great source of inspiration and support. There are several colleagues I would like to especially thank. Dr. Heather Law, who helped at the outset of my research project with suggestions for focusing my proposed research plan. Dr. Measha Bright, whose carpool rides and PhD day coffee breaks will always be fond memories of my time as a PhD student. Emmeline Joyce, whose sense of humour in the office and support with this thesis at different points has been hugely appreciated. Elizabeth Turner, who provided guidance for the scoping review and also acted as a second rater for that study. Dr. Lee Mulligan, who answered many questions I had about sleep actigraphy.
research. And also, Nikki Dehmahdi who currently works alongside me on the iATTp study and whose support has helped me during these final months. I would also like to thank all of the participants who took part in my studies. Finally, I want to thank all of my family and friends who have been supportive and patient while I have conducted this PhD. In particular, my mom, Amy Pearson, who has helped with data entry and been a proof reader for different parts of this thesis. Also, my fiancé Tony Holden for all of his love and encouragement. I would like to dedicate this thesis to my grandpa, Mike McKenna, whose red pen I have missed and who I know would be proud.

The author

Following graduating from university with a degree in psychology in 2007, I moved to the UK and explored different career paths including a management role in supported living homes, a teaching assistant role with children who have autism, and a behaviour support worker role in an intensive behaviour support service for children with learning disabilities and autism. For several years during this period I undertook a postgraduate certificate and diploma course in Autism Spectrum Conditions at Manchester Metropolitan University whilst also taking a lead in the support service for behavioural sleep interventions with the children and their families. During my time as a behaviour support worker, I began volunteering and then working at the Psychosis Research Unit on the TEAMS trial for bipolar disorder, where I first met Dr. Warren Mansell. I was then employed by Dr. Sophie Parker as a research assistant for the Bipolar at Risk Trial. This was a feasibility trial investigating cognitive behaviour therapy for those who meet bipolar at risk criteria. It was during this time in 2015 when I began my PhD. It was also through my experience of both TEAMS and BART that I became interested in learning more about the mood and sleep relationship. More recently, I am now a senior research assistant for the iATTp study. The iATTp study is a feasibility trial investigating the Attention Training Technique intervention for those with psychosis. I have completed these research assistant roles alongside the completion of my thesis.
1. Introduction

1.1. Overview

This thesis aims to gain a better understanding about the role that positive and negative sleep appraisals play in the maintenance of a range of sleep duration disturbances. This chapter will report an integrative review of the literature on the following four areas of research that comprise this thesis topic: the bipolar spectrum, sleep disruption, sleep disturbance interventions, and the proposal of the Integrative Cognitive Sleep Model. Following this, the overall research aims will be outlined with corresponding individual study aims and hypotheses. These individual studies will comprise the empirical chapters of this thesis.

1.2. Bipolar Disorder

Bipolar disorder (BD) represents a severe and chronic mental health illness that is characterised by elevated (manic) and depressed mood states. Both mania and depression are considered two of the oldest mental disorders and were first scientifically described by Hippocrates and the Hippocratic physicians as early as 460BC (Marneros, 2009). BD was later conceptualised in 1851 by Falret, who identified elevated and depressed mood states separated by symptom-free periods. This was coined “folie circulaire”, or circular madness, and was recognised as a recurrent illness (Angst & Sellaro, 2000). At the beginning of the 20th century, Emil Kraeplin classified manic-depressive insanity as a mental disorder and this consisted of mood disturbances that are now considered the bipolar spectrum (Zivanovic & Nedic, 2012). More recently during the latter half of the 20th century, published papers by Akiskal and colleagues began to map the bipolar spectrum (Akiskal & Pinto, 1999), which includes a range of subtypes of elevated and depressed mood disturbances. The current diagnostic criteria for different BD subtypes are outlined in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5) (American Psychiatric Association, 2013) and are explained below.

1.2.1. Mania and Hypomania

Significantly elevated mood, referred to as mania or hypomania, is considered the defining feature of BD (Fiedorowicz et al., 2011; Oswald et al., 2007; Rock, Chandler, Harmer, Rogers, & Goodwin, 2013). According to the DSM-5 (American Psychiatric Association, 2013), the definition of mania and hypomania requires the presence of elevated, expansive, or irritable mood with abnormal and persistent behaviour and energy. This mood must be
accompanied by three symptoms (or four for irritable mood) that include: heightened self-esteem or grandiosity; reduced need for sleep; increased rate of speech; racing thoughts or ideas; distractibility; increased goal oriented activity or agitation; and excessive involvement in activities that have a high potential for negative consequences. For mania, the mood must be present most of the day, nearly every day for at least 7 consecutive days and must cause a significant impairment in social or occupational functioning. Hypomania represents at least 4 consecutive days of this mood being present most of the day, nearly every day and does not cause a significant impairment in functioning. However, if the person requires hospitalisation or experiences psychotic features, the mood episode is considered mania rather than hypomania regardless of the duration. Finally, for both mania and hypomania the mood episode must not be due to substances, such as drugs or medication.

1.2.2. Depression

According to the DSM-5 (American Psychiatric Association, 2013), the definition of a major depressive episode requires either clinically significant depressed mood or loss of interest or pleasure in things the person usually enjoys for a period of at least two weeks. In addition, the person must experience at least four of the following symptoms for most of the day, nearly every day: significant weight loss/gain or appetite increase/decrease; insomnia or hypersomnia; psychomotor retardation or agitation; loss of energy; feelings of worthlessness or excessive/inappropriate guilt; concentration or decision making difficulties; and suicidal ideation or attempt. In addition, these symptoms must result in clinically significant distress or impairment in social, occupational, or another important area of life. Finally, the depressed episode cannot be better explained by a medical condition or the effects of a substance.

1.2.3. Bipolar Spectrum

Depending on the severity and duration of the elevated and depressed mood episodes, the DSM-5 (American Psychiatric Association, 2013) outlines different BD syndromes including those that meet sub-syndromal criteria. At the more severe end of the spectrum, BD Type I is the diagnosis given to those who meet criteria for at least one manic episode. BD Type II is the diagnosis given to those who meet criteria for at least one hypomanic and one major depressive episode. For both mania and hypomania, “with mixed features” can be specified when depressive symptoms are present at the same time. Moving further down the spectrum is Cyclothymia. This is the diagnosis in which criteria is met for recurrent hypomanic episodes and sub-syndromal episodes of depression that do not meet
symptom severity or duration that would constitute a major depressive episode. Cyclothymia criteria occur across a two year period with symptoms absent for no more than two months.

Unfortunately, the above diagnostic criteria does not adequately account for the range of bipolar phenotypes (Cassano et al., 2002). This results in the common misdiagnosis of BD as unipolar depression (Ghaemi, Boiman, & Goodwin, 2000), meaning inadequate or delayed interventions are offered. The DSM-5 (American Psychiatric Association, 2013) introduced criteria for BD clinical states that were previously unspecified in response to evidence that under half of the patients treated for BD were formally diagnosed with the disorder (Angst et al., 2010). This new sub-syndromal criterion for BD is categorised as Other Specified Bipolar and Related Disorder. It applies to those who meet criteria for a major depressive episode and experiences of elevated mood that are either shorter in duration or symptoms than hypomania. Figure 1 (developed by author LP) is a visual spectrum of the varying mood episodes and how the DSM-5 criteria for the individual diagnoses map across.

Figure 1. Bipolar Spectrum

Although the clarification of these sub-syndromal forms of BD is a step in the right direction for operationally defining the wider bipolar spectrum, it still does not take into account different BD spectrum mood experiences that may be indicative of sub-syndromal experiences. It is important to understand how best to identify and support not only those who have BD but also those who may be at risk of developing more severe BD and for who early intervention may be important in promoting a successful outcome (Correll et al., 2007; Skjelstad, Malt, & Holte, 2010). In order to determine an at-risk group, signs and
precursors for BD must be identified to inform at-risk criteria. The main areas in which these at-risk criteria have been researched are familial risk and symptom expression.

### 1.2.4. Familial risk

Previous at-risk research has looked at the offspring of those who have a diagnosis of BD, due to evidence that there is a familial component. Goodwin and Jamison (2007) reported that the risk of developing BD is between 15-30% in people who have a first-degree family member (e.g. parent, sibling, or child) with a diagnosis of BD. This increases to 75% for a person who has two affected first-degree family members. In a review by Correll et al. (2007), all studies showed the offspring of a parent with BD had higher rates of non-specific psychiatric difficulties (e.g. anxiety disorders) which more than doubled the risk of later developing a mood disorder (Duffy, Alda, Hajek, Sherry, & Grof, 2010). This familial component can be explained by nature and nurture approaches. Regarding nature, a parent may pass genes to their offspring that predispose that person to developing a mood disorder (e.g. depression) or the genes lead to a vulnerability that increases the risk of developing a mental health disorder (Goodwin & Jamison, 2007). A nurture approach would explain the familial influence to be a result of living with a person who has a mood disorder and the impact this has on the home environment, on parenting techniques (Costello et al., 2002), or on learned emotional responses.

Although the offspring of a person with BD are shown to have a significantly increased chance of developing the disorder as compared to offspring of unaffected parents, the majority of high-risk offspring do not develop BD. In order to best identify who might be at risk, Duffy et al. (2010) proposed and tested a clinical staging model for high-risk offspring. Based on the available familial research, the model explains that the general progression for developing BD in this group begins with the development of non-mood disorders during childhood, which tend to be anxiety and sleep disorders. This is followed by sub-threshold mood disturbances that develop in adolescence, followed later in mid-adolescence by the first major mood episode. In this research, it was predominantly found that the first major mood episode was depression followed later by an elevated mood episode (mania or hypomania). For this reason, additional symptom expressions that might occur across the BD spectrum should be considered and explored.

### 1.2.5. Symptom Expression

Although offspring are thought to be at higher risk, they do not account for the full group of people who go on to develop BD. Thus it is important to look at other target groups that
will help to capture the wider bipolar spectrum and an at-risk group without the familial component. Symptom expression is one such target area. This is because it is known that symptoms often increase in frequency, duration and intensity prior to reaching clinical significance that then warrants a diagnosis (Castro et al., 2015). Since mania is the defining feature of BD, a bipolar spectrum should be considered that takes into the account the progression of hypomanic features (Fiedorowicz et al., 2011). Two groups that provide clinical information preceding mania include those who display sub-syndromal disorders and those who display sub-threshold symptoms (Correll et al., 2007).

As described above, sub-syndromal bipolar spectrum disorders include the DSM-5 diagnoses Cyclothymia and Other Specified Bipolar and Related Disorder. These diagnostic groups express features of both depression and hypomania that are clinically significant, however the duration or number of these features do not warrant a diagnosis of either BD Type I or BD Type II. In a study by Judd and Akiskal (2003), sub-syndromal elevated mood was reported occurring three times more frequently than syndromal hypomania or mania. This suggests there is a high lifetime prevalence of bipolar spectrum experiences and the need for mental health support. In addition, this highlights the importance of the symptoms experienced in these groups and the need to intervene at this earlier stage to provide support (Fagiolini et al., 2013). It also highlights the need for looking at more sub-threshold symptoms to help identify the at-risk population who are at a less severe level (Correll et al., 2007).

Sub-threshold symptoms are attenuated symptoms that occur before a syndromal state. Such symptoms that are reported to occur before the onset of first-episode mania and mania relapse include a number of mania and depression related symptoms, such as mood change, sleep disturbance, psychotic symptoms, an increase in anxiety, and declines in functioning (e.g. school or work difficulties) (Jackson, Cavanagh, & Scott, 2003; Lish, Dime-Meenan, Whybrow, Price, & Hirschfeld, 1994). Although these symptoms can help to inform the wider bipolar spectrum, there are methodological limitations to collecting this information and developing clinical at-risk criteria. Often the information is reported retrospectively or the symptoms have not been assessed by a clinician to determine the duration or clinical significance (Correll et al., 2007).

Despite these methodological limitations, the at-risk symptomology for mania from existing research tends to consist of the same general sub-threshold depression and hypomanic symptoms (Correll et al., 2007). Following the same procedure that was used to develop ultra-high risk criteria for psychosis (Yung et al., 1998), Bechdolf et al. (2010)
proposed and tested predictive validity (Bechdolf et al., 2014) for an ultra-high risk criteria set for BD. This criteria identifies that help-seeking young people between the ages of 15-25, and who are experiencing sub-threshold symptoms, are at highest risk. Bechdolf et al. (2010) proposed that these sub-threshold symptoms a person would experience are both less in duration and number of symptoms than what would be found for (hypo)mania or depression. Their three ultra-high risk groups are as follows:

“Group 1 – Sub-threshold mania: between 2-4 days of elevated/irritable mood in which the person experiences at least two symptoms from the DSM-IV list of elevated mood symptoms.

Group 2 – Depression + Cyclothymic Features: low mood/loss of interest or pleasure lasting for at least 7 days in which the person experiences at least two symptoms from the DSM-IV list of depressed mood symptoms. This is accompanied by numerous periods of elevated mood that occur in less duration than Group 1 (e.g. at least 4 hours within a day, for 4 cumulative lifetime days).

Group 3 – Depression (same as Group 2) + familial risk (having a first-degree family member with a diagnosis of bipolar disorder)” (Bechdolf et al., 2010, p. 317)

Whilst the predictive validity of this ultra-high risk criteria set is within the early stages, it is currently the most robust criteria representing the clinical symptoms that increase the risk of a person going on to develop syndromal BD as compared to the general population.

1.2.6. Hypomanic Endophenotype

With more recent research investigating the at-risk signs and symptoms for BD, it is important to highlight that these ‘symptoms’ of hypomania are too common in the general population to only be an indicator of subsequent development of BD. The hypomanic endophenotype is the term to account for the personality style of individuals with these at-risk symptom expressions and thus who are at a higher rate of subsequent development of BD (Kwapil et al., 2000). However, not all of these people will go on to develop BD. In fact, research has evidenced that people report positive, functional qualities of these ‘hypomanic’ experiences (Seal, Mansell, & Mannion, 2008). For this reason, it is proposed that a hypomanic endophenotype would need to be combined with common, negative features found across the mental health disorders in order for it to develop into a clinical problem (Mansell, 2016). These common features are considered transdiagnostic features, and are found to be more elevated in people with BD. In particular, Mansell (2016)
highlights negative thinking about high moods is elevated in BD and thus is an indicator of these symptom expressions becoming a clinical disorder.

1.2.7. Bipolar Epidemiology

The prevalence rate of BD is unclear. Research has suggested it occurs in 1-3% of the population (Pini et al., 2005; Regeer et al., 2004) whilst other studies have produced higher prevalence rates of up to 6.5% (Judd & Akiskal, 2003). The higher rates include the wider spectrum of bipolar manifestations in the DSM-IV, such as Cyclothymia (American Psychiatric Association, 2000). Unfortunately, many people do not receive a diagnosis or appropriate support for a number of years (Scott, 2011). On average, this length of time without support is five to ten years (Hirschfeld et al., 2003; Lish et al., 1994; Suppes et al., 2001) and contributes to the overall burden of the disorder. The main reason this might occur is that initial elevated mood symptoms can be difficult to recognise (Angst & Cassano, 2005) or may not pose a significant problem for the person and so are underreported (Fagiolini et al., 2013). A person with BD will often exhibit major depression first and this will be diagnosed as major depressive disorder until a hypomanic or manic episode occurs (Fiedorowicz et al., 2011). It has been suggested that this underreporting accounts for up to 40% of undiagnosed bipolar spectrum experiences (Angst, 2013).

BD has been recognised as a leading cause of worldwide disability (Murray & Lopez, 1997) due to the significant difficulties experienced. These difficulties are associated with high levels of functional impairment (Oswald et al., 2007) in personal, social and occupational capacities (Das Gupta & Guest, 2002). BD is also associated with a higher rate of early death, including suicide (Fagiolini et al., 2013; Oswald et al., 2007). The indirect cost of unemployment and loss of life accounts for 85% of the total cost of BD on society (Das Gupta & Guest, 2002). In addition, early onset BD has been shown to be more severe than adult onset BD. This severity includes a higher level of functional impairment and also a higher rate of mental health comorbidities, such as ADHD, anxiety disorders, and substance use disorders (Correll et al., 2007; Espie, Jones, Vance, & Tai, 2012; Fiedorowicz et al., 2011). This is of concern because up to 65% of people with BD develop it before the age of 19 (Lish et al., 1994; Perlis et al., 2004).

1.2.8. Bipolar Treatments

In order to effectively treat BD, an appropriate diagnosis must be made to ensure the correct treatment option is offered. According to the NICE guidelines (National Institute
for Health and Care Excellence [NICE], 2014), this highlights the importance of assessing for elevated mood when a person presents with depression. Based on the person’s needs and whether they are accessing a primary or secondary service, there are different treatment recommendations for people with BD. These include pharmacological and psychological recommendations.

1.2.8.1. Pharmacological

The NICE guidelines (National Institute for Health and Care Excellence [NICE], 2014) recommends pharmacological treatment for those with BD who experience (hypo)mania. Mood stabilising medication is most commonly prescribed to those who have a diagnosis of BD. Mood stabilisers include lithium, anticonvulsant medicines (e.g. valproate, lamotrigine, carbamazepine) and antipsychotic medicines (e.g. aripiprazole, risperidone, olanzapine, quetiapine). In a review of guidelines by Nivoli et al. (2012), the treatment for (hypo)mania mostly recommends monotherapy (e.g. lithium, valproate, or olanzapine) as the first choice, in order to reduce side effects and medical risks. Combination therapy (atypical antipsychotic plus lithium or valproate) is generally recommended for severe mania or when monotherapy has been unsuccessful in mild or moderate mania. Despite these recommendations, combination therapy in BD is widespread. Although evidence does suggest that combination therapy may be more effective, there are also more side effects with more medication (Grande & Vieta, 2015). Mood stabilisers are not as effective in treating depression symptoms however, and so it is common for BD patients to be prescribed antidepressants, either as monotherapy or in combination (Ghaemi et al., 2006). For antidepressant medication, the recommended guidelines are to discontinue use during a (hypo)manic episode (Nivoli et al., 2012) since they have been linked with treatment-emergent mania (Frye et al., 2009; Gijsman et al., 2005).

1.2.8.2. Psychological

The NICE guidelines (National Institute for Health and Care Excellence [NICE], 2014) recommends a psychological intervention be offered to adults, young people, and children with BD in primary and secondary care who are experiencing depression. This includes an evidence-based manual developed specifically for BD, or a high-intensity intervention such as cognitive behaviour therapy. Cognitive Behaviour Therapy (CBT) is a multicomponent treatment that targets the factors that are presumed to maintain a disturbance. CBT was developed by Aaron Beck (Beck, 1976, 1991) in the field of depression but has since been applied to a range of other difficulties including anxiety, eating, and sleep disorders. Meta-analyses, including a recent one by Chiang et al. (2017),
highlight the positive benefits of CBT for BD include improvements in depression and mania symptoms, reduced relapse rates, and improved psychosocial functioning.

1.2.8.3. Future Directions for Treatment

Research has shown that the longer an illness is left untreated, the worse the outcome can be for that person (Angst & Cassano, 2005). The length of time an illness is untreated is called duration of illness. In the case of BD, a longer duration of illness can mean more mood episodes that may also increase in severity (Drancourt et al., 2013), a poorer response to intervention and treatment (Post et al., 2003) and a higher risk of serious events such as suicide (Fagiolini et al., 2013). For these reasons, more work needs to be done to better understand the wider BD spectrum and the evidence-based interventions that can be offered to people who experience the range of elevated and depressed mood experiences that are indicative of a presentation that may worsen over time. As described earlier, symptom expression is an important area to target. In particular, sleep disruption is an important area to better understand since sleep and mood are closely connected.

1.3. Sleep Disruption

1.3.1. Biology of Sleep

The sleep-wake cycle is a highly complex behaviour that arises from an interaction between regulation systems and timing events. These are circadian rhythms, homeostatic drivers, and timing cues. The homeostatic drivers include neurotransmitters that build during the day, creating the need for sleep which then dissipates during sleep (Foster et al., 2013). The sleep-wake cycle is also maintained by the circadian rhythms which are biological cycles that govern processes that include sleep and wake, temperature regulation, and hormone secretion (Murray & Harvey, 2010; Wirz-Justice, 2003). These cycles are governed by a master circadian “clock” comprised of rhythmic cells located in the suprachiasmatic nucleus, found in the hypothalamus in the brain. This circadian clock is based on interacting feedback processes that coordinate the biological rhythms in the body in response to external environmental cues, or zeitgebers, that act as timing cues. For mammals, the light-dark cycle is a particularly important zeitgeber for setting, or entraining, the body’s inner circadian clock (Reppert & Weaver, 2001). For this reason, circadian rhythms very closely follow the 24-hour day.

Although circadian rhythms are entrained most by the light-dark cycle and thus follow day and night, people also have individual timing for activity/wakefulness. This is termed chronotype (Alloy, Ng, Titone, & Boland, 2017) and is the natural tendency to go to bed
early and wake early (morning-type) or go to bed late and wake up late (evening-type). In addition to entrainment by the light-dark cycle, zeitgebers such as arousal (Mistlberger, Antle, Glass, & Miller, 2010) and social cues (Grandin, Alloy, & Abramson, 2006) can also impact the circadian rhythm. Based on this, the circadian rhythm can become disrupted when there is a change within the environment, or to a change within an internal state. This is evident when comparing sleep-wake cycles for people during the work week and on weekends, with differences in sleep duration and timing observed (Foster et al., 2013). Another example is the jet lag experienced from moving across time zones when travelling by plane.

1.3.1.1. Reward and Circadian Rhythm Dysregulation Model

Unfortunately, sleep and circadian rhythm disruption is very common in mental health disorders. For BD in particular, disrupted circadian rhythms are recognised as being inherently involved in symptom expression (Rosa et al., 2013). One biologically based theory that addresses this link with disrupted circadian rhythm and symptom expression is the Social Zeitgeber Theory. More recently, this theory and the Reward Hypersensitivity Model in BD (both described below) have been integrated into the Reward and Circadian Rhythm dysregulation model which is helping to explain the symptoms, onset and course of BD (Alloy, Nusslock, & Boland, 2015).

1.3.1.1.1. Reward Hypersensitivity Model

The reward system, known as the Behavioural Approach System (BAS), is hypothesised to be overly sensitive in those with BD and this leads to excessive reward motivation and goal striving attainment which is expressed as (hypo)manic symptoms (e.g. elevated energy and decreased need for sleep) (Johnson, Edge, Holmes, & Carver, 2012). BAS-activating events, such as goals and challenges, are theorised to initiate affective responses such as planning or excitement and this is associated with (hypo)manic symptoms. These BAS-activating events have been observed as occurring more for those with BD compared to healthy controls (Urosevic et al., 2010), suggesting that those with a hypersensitive reward system may be at more risk of developing BD episodes when exposed to an increased number of BAS-relevant events.

1.3.1.1.2. Social Zeitgeber Theory

The Social Zeitgeber Theory is a biopsychosocial theory of bipolar spectrum disorders that propose mood episodes, such as depression and (hypo)mania, develop when life events affect social zeitgebers, thus disrupting social and biological rhythms (See Figure 2).
(Grandin et al., 2006). This theory was developed based on initial evidence that people with depression had irregular rhythms, including temperature and sleep-wake cycles (Howland & Thase, 1999). These life events that could affect social zeitgebers, or social rhythm disruption (SRD) events, can be measured using a standardised assessment such as the Bedford Life Events and Difficulties Schedule (LEDS) (Brown & Harris, 1978). The SRD events are rated from 1 (marked, e.g. staying awake all night) to 4 (no disruption) depending on the severity of disruption to schedules and sleep. Upon investigation of SRD events in BD, significant negative life events were shown to be associated with longer BD episode recovery (Johnson & Miller, 1997) and were particularly associated with manic episode onset (Malkoff-Schwartz et al., 1998; Malkoff-Schwartz et al., 2000). These findings support that circadian rhythm disruption affecting the sleep-wake cycle plays an important role in the onset of affective episodes (Ehlers, Kupfer, Frank, & Monk, 1993), emphasizing the importance of sleep on mood.

Figure 2. Social Zeitgeber Theory (Grandin et al., 2006)

<table>
<thead>
<tr>
<th>Internal Trigger</th>
<th>External Trigger (Social Zeitgeber Theory)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abnormality of the Circadian Pacemaker</td>
<td>Life Events</td>
</tr>
<tr>
<td></td>
<td>Changes in Social Zeitgebers</td>
</tr>
<tr>
<td></td>
<td>Social Rhythm Disruption</td>
</tr>
<tr>
<td></td>
<td>Biological Rhythm Disruption</td>
</tr>
<tr>
<td></td>
<td>Other Somatic Symptoms</td>
</tr>
<tr>
<td></td>
<td>Affective Episodes</td>
</tr>
</tbody>
</table>

1.3.2. Importance of Sleep

The integrated Reward and Circadian Rhythm dysregulation model highlights that disrupted sleep patterns are correlated with mood. In the Reward Hypersensitivity Model an overly sensitive BAS can lead to reduced need for sleep while social zeitgebers
affecting the sleep-wake cycle are associated with BD episodes. This sleep disruption has been shown to be present preceding mood episodes (Gruber et al., 2011; Jackson et al., 2003), during mood episodes (American Psychiatric Association, 2013; Ritter et al., 2015) and during periods of time between mood episodes (Rosa et al., 2013). Research specifically investigating whether circadian rhythm disturbance and disrupted sleep patterns are present in people across the wider bipolar spectrum have now found evidence in familial high-risk groups, (Duffy et al., 2010; Jones, Tai, Evershed, Knowles, & Bentall, 2006; Ritter et al., 2015) and high-risk groups that are defined by experiencing a higher rate of hypomanic tendencies, as per the Hypomanic Personality Scale Measure (Ankers & Jones, 2009; Ng et al., 2015). The significant differences found in the high-risk groups as compared to the healthy controls include more variable sleep duration, less sleep efficiency and more specifically, trouble falling asleep and early morning awakening (Ankers & Jones, 2009; Jones et al., 2006; Ritter et al., 2015). The high-risk groups that have been described earlier (familial risk and those who score high on the Hypomanic Personality Scale) do not fully capture the possible at-risk population however. As described before, the Bechdolf et al. criteria (2010; 2014) is recognised as a more robust measure for identifying those at ultra-high risk for BD. In a study by Castro et al. (2015), participants who met this criteria showed more circadian rhythm disruption compared to healthy controls. This included having a poorer sleep quality which was more fragmented and less regular. This evidence highlights that disrupted sleep within BD is both strongly associated with the bipolar spectrum and part of the diagnostic criteria for both depression and elevated mood. Possible clinical symptoms of depression are the experience of insomnia and/or hypersomnia, whilst for (hypo)mania it is reduced need for sleep.

1.3.3. Insomnia

Insomnia is difficulty in falling asleep and/or maintaining sleep. This can include waking up multiple times during the night or waking up earlier than expected and being unable to fall back asleep. The DSM-IV recommends that when determining the clinical significance of insomnia as a symptom for depression, a rule of thumb would be sleeping two hours less than usual on a daily basis (First, Gibbon, Spitzer, & Williams, 2002). There are varying figures on the prevalence of insomnia during mood episodes of BD, from 24% to 100% of patients self-reporting the sleep disturbance (Harvey, 2008b). Although insomnia is assessed as a clinical symptom of depression, it has also been reported as a risk factor for the subsequent development and recurring episodes of the mood disturbance. In an early epidemiological report by Ford and Kamerow (1989), adults with chronic insomnia were
40% more likely to develop major depression. Similar findings continued to be found in longitudinal studies, including 47% of participants who developed depression had reported insomnia at baseline (Eaton, Badawi, & Melton, 1995) and insomnia was a significant predictor of subsequent major depression (Breslau, Roth, Rosenthal, & Andreski, 1996). This association is found across the age groups, with 69% of a community-based sample of adolescents experiencing insomnia prior to depression (Johnson, Roth, & Breslau, 2006) and the elderly who were found to be six times more likely to develop a first-episode of major depression when experiencing prior persistent insomnia (Perlis et al., 2006).

### 1.3.4. Hypersomnia

Hypersomnia is sleeping much more than is normal for that person, or excessive sleepiness. Similarly with insomnia, the DSM-IV recommends two hours more sleep than the typical amount on a daily basis could constitute hypersomnia (First, Gibbon, et al., 2002). The rate of hypersomnia has been reported occurring between 23% and 78% by those with BD depression (Harvey, 2008b; Steinan et al., 2016). As with insomnia, hypersomnia is also reported to occur outside of a depressive episode, occurring 25% to 50% when in an inter-episode state (Kaplan, Gruber, Eidelman, Talbot, & Harvey, 2011) and it predicts the onset of a depressive episode (Kaplan & Harvey, 2009). Hypersomnia has also been reported by individuals who are in clinical remission from depression but do not subjectively believe they are in remission (Zimmerman et al., 2005). This has suggested that hypersomnia may represent a more severe course of depression for some people, recognised as atypical depression. Atypical depression is associated with higher rates of depressive symptoms, suicidal thoughts and attempts, and co-occurrence with anxiety disorders including panic disorder and social phobia (Matza, Revicki, Davidson, & Stewart, 2003).

### 1.3.5. Reduced Need for Sleep

Reduced need for sleep is defined by the DSM-IV as a person getting by on 2 (or more) hours less sleep than usual. The DSM-IV gives examples of a person experiencing reduced need for sleep as someone who reports not needing sleep at all or who feels driven or wired and is thus unable to calm down enough to sleep (First, Gibbon, et al., 2002). The rate of reduced need for sleep occurring during mania has been reported in 69% to 99% of patients through self-report and polysomnography research (Harvey, 2008b). Outside of an elevated mood episode, there is evidence that the sleep disturbance contributes to the onset of (hypo)mania. In two different reviews, sleep disturbance has been consistently reported as a frequent early symptom occurring before the onset of mania (Jackson et al., 2003;
Sierra, Livianos, Arques, Castello, & Rojo, 2007). Specifically, reduced need for sleep has been reported occurring prior to a manic episode by 39% of patients with BD (Correll et al., 2007). Additionally, both prospective (Barbini, Bertelli, Colombo, & Smeraldi, 1996; Bauer et al., 2006; Leibenluft, Albert, Rosenthal, & Weh, 1996) and experimental research (Colombo, Benedetti, Barbini, Campori, & Smeraldi, 1999; Wehr, Goodwin, Wirz-Justice, Breitmaier, & Craig, 1982) have evidenced a decrease in sleep is associated with subsequent (hypo)mania and relevant symptoms.

1.3.6. Shortcomings of Sleep Disturbance Criteria

The research discussed above is important in highlighting the rates of disturbed sleep and the high prevalence for those with BD and who experience mood episodes. However, it should be noted that the diagnostic criteria for assessing these sleep disturbances are not clearly operationally defined. Harvey (2008b) highlights this issue by pointing out that the DSM-IV criteria are vague and often require a subjective judgement to be made by the researcher and/or participant. In addition, some research may use self-report measures. This can lead to inconsistencies in assessment and reports in research.

1.3.7. Sleep Epidemiology

Despite possible inconsistencies in sleep disturbance assessment, the evidence does indicate that sleep disturbance contributes to the onset and relapse of mood episodes. This coupled with the evidence that sleep disturbance is also associated with negative psychosocial, occupational, health and economic effects even in the absence of BD (Ancoli-Israel & Roth, 1999) highlights the importance of addressing sleep. In a more recent report assessing occupational impact, insomnia symptoms were shown to be associated with a higher rate of time off from work, increased risk of accidents in work, and poorer career progression and job satisfaction (Kucharczyk, Morgan, & Hall, 2012). Regarding cognitive performance, those with insomnia exhibit a small to moderate impairment in memory and executive functioning (e.g. verbal fluency and cognitive flexibility) compared to good sleepers (Fortier-Brochu, Beaulieu-Bonneau, Ivers, & Morin, 2012). Disturbed sleep also plays an important role on the affect-regulation system in those who do not have mood experiences that meet criteria for a bipolar spectrum condition. In one study conducted by Zohar, Tzischinsky, Epstein, and Lavie (2005), healthy volunteers experienced worse negative emotions and less positive emotions compared to a control group following four nights of sleep deprivation. In another study, participants who experienced 30 hours of sleep deprivation self-reported more depression symptoms (Scott, McNaughton, & Polman, 2006). The impact of sleep disturbance on healthy participants
reinforces the notion that a disrupted affect-regulation system could have more significant effects on people with BD, since they may have a more vulnerable regulation system (Harvey, 2008b; Harvey, 2011).

1.4. Sleep Disturbance Interventions

1.4.1. Transdiagnostic Approach to Sleep

There has been much emphasis on research on the biological nature of disrupted sleep in BD, proposing that the difficulties experienced are due to circadian rhythm irregularities (Grandin et al., 2006; Rosa et al., 2013). Different research has also evidenced disrupted melatonin release in people with a diagnosis of BD (Nurnberger et al., 2000), which would cause difficulties with sleep onset. Regarding the link with mood, it has been shown that neural circuits involved in both affect and sleep regulation are known to interact in bi-directional ways (Saper, Cano, & Scammell, 2005). However, sleep disturbances are not specific to BD and should not be explained by biological processes alone. There are reported rates that over half of psychiatric patients experience comorbid insomnia, and these rates are suggested to be higher if the insomnia symptoms do not meet full criteria (Harvey, 2001b). Insomnia is prevalent both as a clinical symptom and in the symptom expression for a large number of the disorders (American Psychiatric Association, 2013; Harvey, 2008a). Different forms of sleep disruption play an important role in the development, occurrence of, and relapse of psychiatric disorders (Krystal, Thakur, & Roth, 2008), including psychosis (Reeve, Sheaves, & Freeman, 2015) and anxiety difficulties (Breslau et al., 1996; Ohayon & Roth, 2003). For these reasons, a transdiagnostic approach should be considered as to what additional factors and processes contribute to the development and maintenance of disrupted sleep across the range of mental health conditions.

A transdiagnostic approach considers the biological and cognitive behavioural processes that are common to a range of psychological disorders (Harvey, Watkins, Mansell, & Shafran, 2004). Much previous work has been conducted to understand these processes in specific disorders. Although this has helped to advance our understanding and treatment options for those conditions specifically, similar evidence from different disorder-focused research suggests that these processes are common in both the development and maintenance of a range of psychological disturbances. A transdiagnostic approach can help to explain the high prevalence rate of comorbidity, such as the report that those who are diagnosed with a mental health disorder experience on average two disorders (Kessler et
al., 1994). As such, a significant advantage of a transdiagnostic approach is greater advancement across the range of psychological disturbances.

Due to the high comorbidity of sleep disturbances across mental health disorders and the evidence that these disturbances contribute to the onset, relapse and maintenance of different psychiatric episodes at the sub-syndromal and syndromal level, Harvey (2008a) has proposed that sleep disturbances be considered a transdiagnostic process. Research into this could inform and test the development of a transdiagnostic sleep intervention that may be beneficial to targeting the common processes, thus reducing common symptoms. Further benefits of a transdiagnostic sleep intervention would be the reduced burden on therapists, who must learn numerous disorder-specific interventions (Harvey et al., 2004) and improvements in physical health and overall quality of life (Harvey, Murray, Chandler, & Soehner, 2011). In order to understand how to develop an effective transdiagnostic sleep intervention, the different available interventions that have been researched should be reviewed. These include pharmacological, behavioural, and cognitive interventions.

1.4.2. Pharmacological Sleep Interventions

From a biological point of view, there are pharmacological treatments for sleep disturbances. According to the National Institute for Health and Care Excellence (NICE) guidelines for insomnia, pharmacological therapy is not generally recommended for long-term management. However, for short-term management a hypnotic drug can be prescribed for the shortest period possible (e.g. no more than two weeks) (National Institute for Health and Care Excellence [NICE], 2015). The reason for this is there is evidence that hypnotic drugs often cause side effects such as feeling sedated the next day, as well as increased risks of tolerance and dependence (Greenblatt, 1991). Pharmacological medications to improve sleep are an option for treatment, but in BD specifically these medications have not been shown to fully improve sleep (Gruber et al., 2009). Based on the limitations with long-term management, the known adverse effects, and the limited improvement in BD more treatment options need to be investigated.

1.4.3. Behavioural Sleep Intervention

Behavioural interventions based on the biological modulation of the circadian rhythm have been developed in the field of mood disorders, but have been proposed to be applied in a broader transdiagnostic application (Harvey et al., 2011). These chronotherapeutic interventions involve stabilising biological rhythms through therapeutic light exposure and social and behavioural manipulation.
1.4.3.1. Therapeutic Light Exposure

As discussed earlier, the light-dark cycle is particularly important for entraining the circadian rhythm. This is achieved by photoreceptor cells in the retina that pass information about light and dark to the suprachiasmatic nucleus (Moore, 2007). The suprachiasmatic nucleus then initiates the release or suppression of the hormone melatonin, via the pineal gland (LeProult, Colecchia, L'Hermite-Baleriaux, & Cauter, 2001). Melatonin peaks at night when photoreceptor cells are no longer taking in light and this signals the body to prepare for sleep. As the photoreceptor cells take in light information in the morning, melatonin production is suppressed and the body prepares for being awake. Based on this, if there is inappropriate or irregular timing to light and dark based on behavioural changes, there can be adverse consequences for sleep. “Light therapy” involves timing bright light for a specific duration to support appropriate entrainment of the circadian rhythm. In a meta-analysis by Golden et al. (2005), light therapy was evidenced as significantly reducing depression symptoms in those with seasonal affective disorder and nonseasonal depression. In a different meta-analysis by van Maanen, Meijer, van der Heijden, and Oort (2016), light therapy was evidenced as an effective treatment for insomnia and circadian rhythm sleep disorders, although effect sizes were modest. Caution does need to be applied when conducting light therapy with BD patients, as there is evidence it can induce (hypo)mania (Chan, Lam, & Perry, 1994).

1.4.3.2. Social and Behavioural Manipulation

Based on the social zeitgeber hypothesis, Interpersonal and Social Rhythm Therapy (IPSRT) is the clinical application of stabilising social rhythms in order to reduce the risk of mood episodes indicative of BD (Frank, Swartz, & Kupfer, 2000). IPSRT is a behavioural psychotherapy that focuses on educating the patient about the link between mood and life events, the importance of maintaining a regular social rhythm, identifying and managing rhythm dysregulation triggers, and management of affective symptoms. For those with BD, IPSRT delivered immediately following a mood episode has shown reduced recurrence of the mood episode (Frank et al., 2005). Although IPSRT has been mainly developed for and researched with the BD population, Harvey et al. (2011) suggests that the behavioural approach of stabilising the biological rhythm could benefit a wide range of symptoms and psychiatric disorders.
1.4.4. Cognitive Sleep Intervention

Understanding the biological and behavioural approaches to sleep disturbance is necessary to the development and advancement of treatment options. However, a transdiagnostic approach requires understanding the cognitive mechanisms also. Insomnia is the sleep disturbance that has received the most attention in the research and clinical fields for understanding the cognitive processes that underpin this sleep disturbance and provide a good starting point for better understanding the cognitive mechanisms that may underpin the wider range of sleep disturbances. These insomnia specific processes are outlined in the Cognitive Model of Insomnia (described below) and are targeted in CBT for Insomnia (CBT-I).

1.4.4.1. Cognitive Model of Insomnia

Research summarised by Harvey (2002a) identifies the key, cognitive processes that contribute to the development and maintenance of insomnia. These processes work within two cycles and include attention, perception, counterproductive safety behaviours, and maladaptive beliefs (see Figure 3). The first cycle begins with the experiences of intrusive thoughts and excessive worry throughout the day and before sleep. These thoughts and worry result in increased negative cognitive activity, which in turn activates the sympathetic nervous system and results in a heightened arousal state (e.g. fight or flight mode). Due to being in this fight or flight mode, attention becomes focused on threat based cues. When threat based cues are perceived in this state, it can result in the person overestimating the extent of their perceived loss of sleep or daytime performance on the following day. This overestimation is a “distortion of reality” (Beck, 1976, p. 218). Distortions of reality are seen in other disorders, such as in panic disorder when a person experiencing a panic attack believes they are having a heart attack (Clark, 1986).
The second cycle in Harvey’s Cognitive Model of Insomnia (Harvey, 2002a) is additional exacerbating processes that worsen the negative cognitive activity that develops in the first cycle. This includes safety behaviours and maladaptive beliefs. Safety behaviours are strategies a person will develop in order to avoid a feared outcome, such as drinking alcohol to help fall asleep quickly. However, safety behaviours are problematic. One reason they are problematic is because they can prevent disconfirmation of maladaptive beliefs about sleep (Salkovskis, 1991). Maladaptive beliefs about sleep are sleep-disruptive cognitions that have been found to be more highly endorsed by adults with insomnia as compared to good sleepers (Morin, Stone, Trinkle, Mercer, & Remsberg, 1993). In the case of a person who drinks alcohol to fall asleep more quickly, the belief held might be that alcohol helps them to fall asleep better. If a person who drinks alcohol to sleep better does in fact fall asleep more quickly, that person will be more likely to endorse the belief that alcohol is helping his sleep. However, the consequence of drinking alcohol before bed can in fact worsen sleep continuity throughout the night. This will result in real loss of sleep which in turn will escalate the cycle of negative cognitive activity, arousal, distress, and monitoring for sleep related threat cues. The clinical implications of this model highlight
that treatment for insomnia should be aimed at reducing the selective attention and monitoring for threat based cues, correcting distortions of reality, eliminating the use of counterproductive safety behaviours, and correcting the maladaptive beliefs about sleep (Harvey, 2002a) which can be targeted in CBT-I.

**1.4.4.2. Cognitive Behaviour Therapy for Insomnia (CBT-I)**

For long-term insomnia that is either primary or secondary, the NICE guidelines recommend cognitive and behavioural treatment (National Institute for Health and Care Excellence [NICE], 2015). Cognitive Behavioural Therapy for Insomnia (CBT-I) is a multicomponent treatment targeting the processes of the vicious cycle of poor sleep that includes negative behaviour, negative thoughts, and negative emotions. Cognitive and behavioural techniques are applied to address these cognitive and behavioural factors in order to promote a healthy sleep pattern. The different components of CBT-I are based on the Cognitive Model of Insomnia and behavioural techniques derived from theory are described below.

**1.4.4.2.1. Cognitive Components**

One cognitive component to reduce worry and rumination is cognitive control. This involves different techniques to stop the intrusion of worries and other unwanted pre-sleep activity. This can include forward planning, which involves making time during the evening to address these cognitions and then set them aside. This technique has been shown to be useful for sleep-onset (Levey, Aldaz, Watts, & Coyle, 1991). In the event an unwanted cognition enters a person’s awareness when either trying to sleep or if woken up during sleep, thought suppression can be employed. This involves the person actively interrupting unwanted pre-sleep cognitive activity by saying a particular word, such as “the” (Levey et al., 1991) or “stop” (Wolpe, 1971). A second cognitive component is paradoxical intention. This technique is based on the theory that by actively trying to fall asleep, arousal and performance anxiety are raised. This in turn hinders or prevents the onset of sleep. Paradoxical intention requires the person to instead keep themselves awake. This in turn reduces the person’s active effort to sleep, thus allowing sleep onset to happen more easily (Espie & Lindsay, 1985). Imagery training is another cognitive component that involves visualising pre-determined objects (e.g. candle) and focusing attention on these objects when unable to fall asleep (Woolfolk & McNulty, 1983). A fourth component is addressing misperception. Often with insomnia a person will overestimate how long it takes them to fall asleep and also underestimate how long they slept for. Incorporating a sleep diary or actigraphy watch to objectively record sleep can help to reduce this...
misperception of sleep, thus reducing anxiety (Tang & Harvey, 2006). A fifth component is cognitive restructuring. This aims to change the unhelpful beliefs that a person with insomnia endorse about their sleep, thus perpetuating the feedback loop to negative cognitive activity (see Fig 2). Harvey, Sharpley, Ree, Stinson, and Clark (2007) introduced targeting unhelpful beliefs via individualised experiments rather than through education or other verbal techniques alone. Finally, additional components specific to Harvey’s Cognitive Model of Insomnia (Harvey, 2002a) include interventions to reduce the use of safety behaviours and to reduce attentional bias and monitoring for sleep-related threat, such as monitoring the clock (Harvey et al., 2007).

1.4.4.2.2. Behavioural Components

One behavioural component is stimulus control. This therapy component is intended to strengthen the association of bed and the bedroom with sleep whilst weakening the association with arousal, and develop a consistent sleep-wake schedule (Bootzin & Perlis, 2011). For example, if a person were unable to fall asleep within 10 minutes the advice is to leave the bedroom, thus limiting the sleep incompatible behaviours associated with the bedroom (Harvey & Tang, 2003). A second component, developed by Spielman, Sasin, and Thorpy (1987) is sleep restriction. This component is based on time in bed being a maintaining feature of insomnia. It involves bringing the total time in bed to the average amount of actual nighttime sleep the person gets. This can involve having the person stay in bed longer (to allow sleep to consolidate) or less (to maximise sleep efficiency). A third component is sleep hygiene training, which involves an education session on factors that can negatively impact sleep. These factors include the sleep environment, ingested substances (e.g. caffeine), sleep scheduling, presleep activities, daytime behaviours, and attitudes towards sleep (Lacks, 1987). A fourth component is relaxation training, which is intended to reduce psychophysiological arousal via techniques including yoga or muscle relaxation (Harvey & Tang, 2003).

1.4.4.3. Cognitive Behaviour Therapy for Insomnia in Bipolar Disorder

Multiple meta-analyses, most recently by van der Zweerde, Bisdounis, Kyle, Lancee, and van Straten (2019) have shown CBT-I to be effective at 3, 6, and 12 month follow-ups for insomnia severity, sleep efficiency and sleep onset latency. Based on the evidence that CBT-I can be beneficial in improving sleep and the bidirectional pathway between sleep and mood, Harvey, Kaplan, and Soehner (2015) proposed researching more into the usefulness and effectiveness of CBT-I in the BD population. Harvey and colleagues go on to explain that the advantage of investigating psychological approaches for reducing BD
symptoms is to provide an alternative to medication which can have adverse effects or lead to tolerance and dependency. In addition, there is a link between substance use disorders and BD, cautioning that insomnia medications could be at risk of being abused. A further advantage is CBT-I is in line with a transdiagnostic approach since sleep problems are common across the disorders. In a meta-analysis conducted by Wu, Appleman, Salazar, and Ong (2015), the overall findings of CBT-I delivered to those with a psychiatric disorder (e.g. major depressive disorder or post-traumatic stress disorder) and comorbid insomnia indicated positive effects on both insomnia symptoms and outcome measures for mood and functioning.

Although the findings are positive for CBT-I, insomnia does not capture the full range of sleep disturbances experienced by those with BD or across the wider psychiatric disorders. In order for a CBT sleep intervention to be transdiagnostic it needs to address a wider spectrum of sleep disturbances. Harvey (2016) explains that when she and her colleagues began to investigate a transdiagnostic sleep intervention they focused initially on BD due to the interrelationship of elevated and depressed mood episodes with a wide range of sleep disturbances (e.g. insomnia, hypersomnia and reduced need for sleep). This led to the development and investigation of an adapted CBT-I that incorporated elements from IPSRT (Frank et al., 2005) for developing regular social rhythms, light and dark therapy (Wirz-Justice, 2003), and motivational interviewing (Rollnick & Miller, 1995) for encouraging behaviour change. In a pilot study comparing the delivery and efficacy of this adapted therapy (CBTI-BP) against psychoeducation, the CBTI-BP findings indicated a reduced risk of mood relapse through to the 6-month follow-up compared to the psychoeducation group, as well as improvements in insomnia symptoms. Although the addition of several behavioural elements were added to the CBTI-BP, it is not clear what adaptations were made to the cognitive component. Harvey, Soehner, et al. (2015) explain the cognitive module included altering unhelpful beliefs about sleep and reducing sleep-related anxiety and rumination. A key aim of CBT is to challenge unhelpful beliefs, and research has shown CBT-I is effective in reducing these beliefs and this is correlated with positive insomnia outcomes (Edinger, Wohlgemuth, Radtke, Marsh, & Quillian, 2001). These beliefs are most commonly measured by the Dysfunctional Beliefs and Attitudes about Sleep Scale.

1.4.4.4. The Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS)

The DBAS consists of statements that relate to insomnia specific cognitions that consist of beliefs, attitudes, and appraisals. Morin et al. (1993) developed the measure based on
clinical experience with older adult, primary insomnia patients and the theoretical conceptualisation of insomnia. The belief statements map across the following themes: “(a) misattributions or amplification of the consequences of insomnia, (b) diminished perception of control and predictability of sleep, (c) unrealistic sleep expectations, (d) misconceptions about the causes of insomnia, and (e) faulty beliefs about sleep-promoting practices” (Morin et al., 1993, p. 464). These statements identify clinically significant levels of unhelpful beliefs related to sleep that can then be targeted in therapy, thus helping to correct the cognitive cycle of insomnia (Morin, Vallieres, & Ivers, 2007). Although the DBAS is not a diagnostic tool for insomnia, it has been able to discriminate poor sleepers from good sleepers (Carney et al., 2010).

1.4.4.5. Dysfunctional Sleep Beliefs in BD

The DBAS has been used to assess for sleep cognitions in the BD population. In a study by Harvey, Schmidt, Scarna, Semler, and Goodwin (2005), the DBAS was compared between those with BD, those with insomnia, and those with good sleep. The results showed there was no significant difference on the total score for the DBAS between the BD and insomnia groups, but both scored higher than the good sleeper group. This finding suggests that unhelpful beliefs about sleep also play a key role in sleep disruption for those with BD as well as those with primary insomnia. More recently in a study by Ng, Chung, Ng, Lee, and Chan (2016), participants with inter-episode BD completed a range of measures that included the abbreviated version of the DBAS (DBAS-16). The results showed that those participants who reported significantly higher scores on the DBAS statements related to sleep worries and disagreement with sleep medication were shown to have higher levels of sleep irregularities. Regarding the statements representing disagreement with sleep medication, it has been shown that these have low reliability for accurately assessing this type of sleep belief with insomnia patients (Carney et al., 2010). Overall however, the study by Ng et al. (2016) provides evidence that unhelpful cognitions related to insomnia are associated with sleep irregularities in the BD population.

1.5. Proposal of the Integrative Cognitive Sleep Model

1.5.1. Missing “Positive Side”

Although the DBAS highlights promising evidence that unhelpful beliefs about insomnia are present for those with BD, the assessment tool does not necessarily match the full complexities of sleep disturbances and potential related beliefs that people with BD can experience. The DBAS accounts for only negative, unhelpful sleep beliefs in the context of
insomnia specifically. Not only do people with BD experience insomnia, but they can also experience hypersomnia or reduced need for sleep.

Research in sleep beliefs is missing to account for the defining feature of BD – elevated mood experiences and the changes to sleep experienced during this heightened emotional state. Both positive and negative emotions are important in helping a person to pursue and achieve their goals. However, too high levels of positive or negative mood are associated with negative psychological health outcomes. This could apply to the context of sleep as well. In both the BD and at the at-risk population, studies have shown there is increased engagement in heightened pursuit of rewards (Berridge & Kringelbach, 2008) and overly ambitious goal setting (Gruber & Johnson, 2009). These are both traits that are features of the neurobiological Behavioural Activation System (BAS) sensitivity model (Johnson et al., 2012). The BAS is defined as an “approach toward reward-relevant stimuli, in which the goal is to move toward something desired” (Johnson et al., 2012, p. 245). In the case of (hypo)mania, engagement in goal pursuit can in fact be maladaptive and have potentially negative consequences. For this reason, it is important to understand how best a person can cope with those processes and down-regulate the elevated state.

Gruber (2011) has coined the process of heightened emotional state as Positive Emotion Persistence (PEP). PEP is distinguishable from non-clinical populations, and has shown to be relevant in both the BD and at-risk population. The key feature of PEP is the lack of flexibility in being able to shift positive emotion responses when the context is not appropriate. An example of this occurring in (hypo)mania is when a person might engage in pleasure seeking activities that have a negative or painful consequence, such as spending savings on an impulsive purchase. This maladaptive “positive” side could also be relevant to the sleep disturbances a person with BD might experience. For example, someone who has been depressed for a period of time and begins to feel heightened in mood may make active choices to forgo sleep in order to take advantage of feeling good.

1.5.2. The Integrative Cognitive Model

In order to study this “positive” side and understand the cognitive processes that might maintain a person’s sleep disturbances, an appropriate cognitive framework should be used as a guiding model. One such framework is the Integrative Cognitive Model (ICM) (Mansell, Morrison, Reid, Lowens, & Tai, 2007). The ICM is guided by previous research (Healy & Williams, 1989; Jones, 2001) that proposed circadian rhythm disruptions can be subject to internal appraisals. For example, experiencing elevated mood might be personally appraised as “I can achieve anything I want.” Positive, self-relevant personal
appraisals such as this could result in active behaviours (e.g. risk-taking behaviour) that then perpetuate the cycle of circadian rhythm disruption and symptom expression. The Hypomanic Interpretations Questionnaire (HIQ) (Jones, Mansell, & Waller, 2006) assesses for these positive appraisals and has shown association with hypomanic personality scores in a student sample and for those with BD (Jones, Mansell, et al., 2006). Opposite to positive appraisals relevant to (hypo)mania, the Interpretations of Depression Questionnaire (IDQ) (Jones & Day, 2008) assesses for negative self-relevant appraisals related to low mood experiences, and has been shown to predict depression symptoms in an analogue sample.

The ICM integrates and expands upon these theories and different psychological processes to explain the exacerbation of mood in BD. It proposes that mood exists along a continuum for everyone and becomes problematic for people when it is appraised in an extreme and conflicting way (Mansell et al., 2007). Specifically, when negative thinking about high mood is combined with positive thinking about high mood (Mansell, 2016), this seems to lead to ascent (driving mood up) or descent (driving mood down) behaviours to regulate the activated state potentially exacerbating mood swings (Kelly et al., 2011). For example, a person may hold beliefs about high mood being an opportunity to achieve desired goals while contrastingly believing that high mood is a sign of an impending breakdown. As these appraisals enter awareness the person will engage in ascent or descent behaviours to regulate their state. Hence, changes in mood are not the maintaining feature of BD. Rather, it is the thought processes or cognitions that play a key role in the mood fluctuations. These cognitions, which include appraisals, are known to maintain other psychological disorders. In panic disorder, catastrophic misinterpretations of body sensations can trigger panic symptoms (Clark, 1986). In psychosis, circadian rhythm disruption can trigger intrusions (e.g. hallucinations) that are appraised negatively and thus perpetuate the cycle of psychosis experiences (Morrison, 2001). Since these cognitions are found across the psychological disorders, they are considered transdiagnostic processes (Harvey et al., 2004). For this reason, the ICM is a model that can be used with mood fluctuations found in other disorders (e.g. anxiety disorders) and sub-clinical mood fluctuations (e.g. at-risk populations). See Figure 4 for an illustration of the model (Mansell et al., 2007)
1.5.3. The Hypomanic Positive Predictions Inventory (HAPPI)

The ICM has been supported in research conducted across the spectrum of BD experiences with the use of the Hypomanic Attitudes and Positive Predictions Inventory (HAPPI) (Mansell, 2006). The HAPPI is a self-report questionnaire that assesses for both positive and negative appraisals of high and low activation states. Higher HAPPI scores have been reported by those with BD Type I as compared to a non-clinical control group and those with unipolar depression (Mansell et al., 2011), indicating more extreme and conflicting beliefs endorsed by those with elevated and depressed mood swings. The HAPPI has also been shown to predict subclinical symptoms for BD (Dodd, Mansell, Morrison, & Tai, 2011a). This finding supports the notion that extreme appraisals exacerbate mood and are present in at-risk populations of people for BD. Another at-risk group in which extreme appraisals are present include adult offspring of parents who have a diagnosis of BD, regardless of their own experience of mood swings (Ruggero, Bain, Smith, & Kilmer, 2015). The ICM was further supported in a non-clinical sample of adolescents who showed extreme conflicting appraisals of mood states in relation to mood symptoms and hypomanic tendencies (Kelly, Smith, Leigh, & Mansell, 2016).
As a cognitive measure, the HAPPI can be used in intervention work with people to identify the extreme appraisals that may be playing a role in exacerbating their mood swings (Mansell et al., 2014). Cognitive therapy can then be tailored for each person to address these extreme appraisals and the resulting attempts to control internal states. It is this attempt to control internal states that leads to conflict and ultimately interferes with a person’s goals. Intervention can be developed to ensure that the person identifies and works toward their goals whilst learning how to better manage their moods.

1.5.4. An Integrative Cognitive Sleep Model

As discussed earlier, it is clear that sleep and mood are intricately linked. Both represent an internal state for a person, with sleep being a physiological internal state and mood being an emotional internal state. Research has shown that for both sleep and mood, beliefs or appraisals are a significant factor in the maintenance of difficulties (Harvey, 2002a; Mansell et al., 2007). In order to expand upon the understanding of sleep across the mood spectrum and develop more effective interventions for sleep difficulties that occur both in depressed and elevated mood states, the role of sleep beliefs should be explored using the ICM as a guiding model.

There is preliminary research that highlights the need to explore beliefs and appraisals representative of elevated mood in relation to sleep. In a recent study by Banks, Lobban, Fanshawe, and Jones (2016) the relationship between circadian rhythm instability, mood, and internal appraisals was looked at. The results highlighted that poor, self-reported sleep quality and internal, positive appraisals may represent vulnerability factors in BD. The interaction of these two factors with mood showed a trend for the positive appraisals mediating the relationship between circadian rhythm stability and activated mood. However, it is important to note that this relationship had a small effect size and did not utilise a sleep belief measure or the HAPPI. The researchers conclude by recommending that more work needs to be conducted in this area in order to learn more about the relationship (Banks et al., 2016)

The ICM can be used to learn more about the relationship of appraisals with fluctuating sleep disturbances experienced across the mood spectrum. It is proposed that the ICM can act as a guide to explain this relationship in a cyclical model that we are coining the Integrative Cognitive Sleep Model (ICSM) (See Figure 5). The ICSM is a subset of the ICM and focuses on excessively short or long sleep duration. In this cycle, extreme and conflicting appraisals regarding sleep maintain and exacerbate sleep disruption. The sleep disruption is then further appraised in extreme ways. The impact of sleep disruption and
the related appraisals are also theorised as having an impact on mood, activity and arousal which links back with the original ICM. This cognitive framework may help in identifying and intervening among people who are at-risk. It could also inform future psychological interventions. Interventions would involve helping clients to re-evaluate their appraisals of sleep to support ones that are less extreme and more compatible with one another and with the person’s important life goals. In order to achieve this, work will need to expand upon the negative beliefs that are represented in the DBAS to encompass positive sleep beliefs and sleep beliefs that are relevant to elevated mood. The HAPPI can be used as a cognitive measure framework to follow by exploring positive and negative beliefs with sleep disruption.

Figure 5. Integrative Cognitive Sleep Model

Sleep occupies many domains such as insomnia, hypersomnia, reduced need for sleep (American Psychiatric Association, 1994), frequent night-time awakenings, and subjective and objective sleep experiences (Buysse, Ancoli-Israel, Edinger, Lichstein, & Morin, 2006). In order to best capture sleep disruption in line with the proposed ICSM, sleeping “too much” or “too little” easily summarises the extreme conflict that a person might experience regarding their sleep. Hence, it is important to explore positive and negative appraisals for both sleeping too much or too little in the context of mood difficulties. A clinical example of these potential conflicting appraisals and impact on sleep include
beliefs such as “I will stay up very late or all night to avoid feeling bored” and “I sleep more to keep myself safe.” As these appraisals enter awareness, the person might engage in behaviours that either drive their sleep to be longer in duration (hypersomnia) or less in duration (reduced need for sleep). Based on the evidence that sleep disruption plays a key role in the development and maintenance of mood disturbances, it is important that we understand these possible cognitive mechanisms driving sleep fluctuation.

1.6. Conclusion

This thesis aims to better understand the role of positive and negative sleep cognitions in the context of fluctuating sleep duration disturbances (insomnia, hypersomnia, and reduced need for sleep) that are often experienced across the mood spectrum. The three overarching aims are: 1) develop a sleep cognition measure that assesses for positive and negative appraisals of excessively short or long sleep durations; 2) establish initial validity and reliability for this sleep cognition measure and 3) use this sleep cognition measure to test the proposed ICSM. In order to investigate these aims, a number of studies were devised with individual aims and hypotheses. These are outlined below.

1.6.1. Research Aim 1: Develop a sleep cognition measure that assesses for positive and negative appraisals of excessively short or long sleep durations

1.6.1.1. Aim 1.1 / Study 1

Conduct a scoping review to discover the range of self-report sleep cognition measures discussed in the literature for the sleep disturbances insomnia, hypersomnia, and reduced need for sleep.

1.6.1.2. Aim 1.2 / Study 2

Conduct a Delphi method study in order to explore and identify expert consensus on positive and negative sleep appraisals in the context of low and high mood states.

1.6.2. Research Aim 2: Establish initial validity and reliability for this sleep cognition measure

1.6.2.1. Aim 2.1 / Study 3

Explore the factor structure of the sleep cognition measure

1.6.2.2. Aim 2.2 / Study 3
Review the construct validity of the sleep cognition measure with validated measures representing BD personality, mood, sleep, and cognition relevant to both mood and sleep.

1.6.2.2.1. Hypothesis 2.2.1

The sleep cognition measure is expected to be positively associated with high and low mood tendencies, poor sleep quality, and cognitions that maintain both sleep disruption and shifts in mood.

1.6.2.3. Aim 2.3 / Study 4

Test the sleep cognition measure in line with the ICM by comparing individuals who experience both elevated and depressed mood states (a BD spectrum group) with two control groups (unipolar depression and non-clinical groups).

1.6.2.3.1. Hypothesis 2.3.1

The BD spectrum group will score significantly higher than the two control groups on the overall sleep cognition measure mean, due to their increased vulnerability to the wide range of sleep disturbances.

1.6.2.3.2. Secondary hypothesis 2.3.2

The overall DBAS mean will be significantly higher in both the BD spectrum group and the unipolar depression group compared to the non-clinical group.

1.6.2.3.3. Secondary hypothesis 2.3.3

The overall mean for the HAPPI will be significantly higher for the BD spectrum group than both the unipolar depression group and the non-clinical group.

1.6.3. Research Aim 3: Use this sleep cognition measure to test the proposed ICSM

1.6.3.1. Aim 3.1 / Study 3

Conduct a hierarchical regression to explore the sleep cognition measure’s predictive usefulness with a validated sleep quality measure over age, gender, BD tendency and the commonly used DBAS measure.

1.6.3.2. Aim 3.2 / Study 5

Test if the sleep cognition measure predicts a person’s sleep shifting from short to long duration sleep disturbances, night by night.
1.6.3.2.1. Hypothesis 3.2.1

Higher mean scores for the sleep cognition measure will predict higher rates of subjective and objective total sleep time (TST) variability.

1.6.3.3. Aim 3.3 / Study 5

Conduct a hierarchical regression to test the incremental validity of the sleep cognition measure on subjective and objective validity, entered following associated variables.
2. Methodology

Chapter 1 provided an overview of the background of the research area and outlined the aims and hypotheses of this thesis that have been conducted in the subsequent studies. The studies undertaken have been written in individual peer-review journal format. This means the method section for each study is limited in word count. For this reason, Chapter 2 will provide a detailed explanation of the methodologies employed throughout this thesis and identify where and how the aims and hypotheses are addressed.

2.1. Overview of studies included in this thesis

2.1.1. Research Aim 1: Develop a sleep cognition measure that assesses for positive and negative appraisals for excessively short or long sleep durations

Study 1 addressed the first aim, which was a scoping review of the literature for available sleep cognition measures developed for those with insomnia, hypersomnia, or reduced need for sleep (Aim 1.1). Study 2 also addressed the first aim, which was to begin the development of a new sleep cognition measure (Positive and Negative Sleep Appraisal Measure (PANSAM)) that accounts for those with variable sleep duration lengths indicative of insomnia, hypersomnia, or reduced need for sleep (Aim 1.2). Study 2 was developed in response to no identified sleep cognition measures developed specifically for hypersomnia or reduced need for sleep at the outset of this research project. Study 2 utilised a Delphi method approach with identified clinical and research experts in the field of BD in order to account for a wide range of experience with this clinical group.

2.1.2. Research Aim 2: Establish initial validity and reliability for this sleep cognition measure (PANSAM)

Addressing the second aim, the Pilot Study was a service user review of the PANSAM to check construct and face validity\(^1\). Study 3 also addressed the second aim, which was to conduct initial psychometric testing of the PANSAM. This quantitative study employed a cross-sectional technique and surveyed members of the general public in order to review

---

\(^{1}\) The Pilot Study is not an individual chapter within this thesis. It was conducted as part of the Bipolar At Risk Trial (BART) to inform the possible use of an appropriate sleep cognition measure in a future trial. The Pilot Study does provide face validity assessment of the PANSAM by a client group, and also compares the PANSAM with the commonly used DBAS measure. For this reason, it was agreed the results of the PANSAM and DBAS feedback forms would be useful to include in this thesis for additional validity information. It was agreed by the research team to only include as an Appendix since it does not fit neatly within the conducted studies of this thesis.
the factor structure (Aim 2.1) and the construct validity of the PANSAM with relevant validated measures (Aim 2.2). For Aim 2.2, it was hypothesised (Hypothesis 2.2.1) that the PANSAM will be positively associated with high and low mood tendencies, poor sleep quality, and cognitions that maintain both sleep disruption and shifts in mood.

Study 4 addressed both the second and third aims, which was to test this measure with different clinical groups to identify any distinctions the PANSAM makes between those with different mood experiences and with a non-clinical group (Aim 2.3). This quantitative study employed a cross-sectional technique and surveyed participants who either met high and low mood experiences (BD group), low mood experiences (unipolar depression group), or did not experience a mental health difficulty (non-clinical control group). The main hypothesis for Study 4 (Hypothesis 2.3.1) was the BD spectrum group will score significantly higher than the two control groups on the overall PANSAM mean, due to their increased vulnerability to the wide range of sleep disturbances. Two secondary hypotheses were also tested. The first (Hypothesis 2.3.2) is the overall DBAS mean would be significantly higher in both the BD spectrum group and the unipolar depression group compared to the non-clinical group. The second (Hypothesis 2.3.3) is the overall mean for the HAPPI will be significantly higher for the BD group than both the unipolar depression group and the non-clinical group. Finally, Study 5 provided additional psychometric testing for the second aim. This involved reviewing construct validity and reliability.

2.1.3. Research Aim 3: Use this sleep cognition measure (PANSAM) to test the proposed ICSM

In order to begin testing the proposed ICSM, several analyses were conducted in the different studies. Study 3 conducted a hierarchical regression to explore the sleep cognition measure’s predictive usefulness with a validated sleep quality measure over age, gender, BD tendency and the commonly used DBAS measure (Aim 3.1). Following this, Study 5 was established in order to conduct a more robust test of the ICSM by exploring if the PANSAM predicts sleep variability. This prospective, quantitative study with members of the general public employed a sleep diary and actigraphy watch in order to calculate objective and subjective sleep variability over a two week period (Aim 3.2). The hypothesis for Aim 3.2 (Hypothesis 3.2.1) was that higher scores for the PANSAM would predict higher rates of subjective and objective TST variability. A further test of the proposed ICSM in Study 5 was a hierarchical regression to test the incremental validity of the PANSAM on subjective and objective TST variability, entered following associated
variables (Aim 3.3). These tests assessing the predictive ability of the PANSAM continued to contribute to the overall validity testing for the measure.

2.2. Developing and validating a measure

In order to test the proposed ICSM, it is necessary to have an appropriate measure that will assess for the construct of positive and negative sleep cognitions in the context of fluctuating sleep disturbances. Measures, such as self-report questionnaires, “offer an objective means of collecting information about people’s knowledge, attitudes, and behaviour” (Boynton & Greenhalgh, 2004, p. 1312). Based on the review of the literature explained in Chapter 1, there was no identified measure that assessed for this construct and so it was agreed by the research team that a new measure would need to be developed. For this reason, the aims of this thesis focus on the development, validation, and testing of a new measure and follow guidelines that match those set out by Boateng, Neilands, Frongillo, Melgar-Quinonez, and Young (2018) and Tsang, Royse, and Terkawi (2017).

2.2.1. Preliminary Considerations

2.2.1.1. Aim 1.1 / Study 1: Conduct a scoping review to discover the range of self-report sleep cognition measures discussed in the literature for the sleep disturbances insomnia, hypersomnia, and reduced need for sleep.

Before developing a measure, it is important to ensure a validated one is not already available for use. Although this was indicated in a review of the literature, a formal scoping review was conducted to confirm this. The scoping review is defined as a “form of knowledge synthesis that addresses an exploratory research question aimed at mapping key concepts, types of evidence, and gaps in research related to a defined area or field” (Colquhoun et al., 2014, pp. 1292, 1294). Arksey and O’Malley (2005) highlight two strengths of the scoping review. First, compared to different review methodology the scoping review allows the researcher to undertake multiple searching methods, thus maximising breadth of the literature. Second, there is flexibility in summarising the literature. This means the researcher can interpret the information to highlight common approaches used, identify gaps in the knowledge base, and provide a foundation for future study and research questions. These strengths meant the scoping review methodology was suitable for informing this relatively under researched construct of positive and negative sleep cognitions in the context of fluctuating sleep disturbances.

2.2.2. Development Process
In order to develop a sleep cognition measure in line with the proposed ICSM, the research team considered several issues. First, it was agreed the measure should be comprised of four subscales. These are: 1) positive appraisals of sleeping less than usual; 2) negative appraisals of sleeping less than usual; 3) positive appraisals of sleeping more than usual; 4) negative appraisals of sleeping more than usual. Since the fluctuating sleep disturbances of interest vary in total sleep time (e.g. insomnia is less sleep than usual and hypersomnia is more sleep than usual) this multidimensionality of the construct ensures the full spectrum of positive and negative sleep cognitions are accounted for. For the format of the measure, the HAPPI was used as a guide for instructions and rating scale.

2.2.2.1. Aim 1.2 / Study 2: Conduct a Delphi method study in order to explore and identify expert consensus on positive and negative sleep appraisals in the context of low and high mood states.

Due to the limited information available in the literature specific to this construct, Boynton and Greenhalgh (2004) recommend a qualitative approach be employed for exploring the range of sleep cognitions. The research team decided upon the Delphi method for developing and refining the appraisal statements that would make up this new measure. The Delphi methodology is most often considered a quantitative method since the focus is on statistical consensus of an agreed topic conducted with a panel of anonymous experts (Hasson, Keeney, & McKenna, 2000). Despite the quantitative emphasis, qualitative components can be incorporated. For Study 2, identified clinical and research professionals with experience of BD were invited to take part in a first round of the Delphi study. This was a feedback round for providing ratings and feedback (e.g. word changes) for the statements the research team had developed, whilst also allowing the participants to suggest additional appraisals based on their experience. Themes were suggested for the participants to consider: interpersonal distress, hyper-arousal, sleep-related worry and helplessness, expectations about sleep need, and beliefs about the consequences or effects of sleep. The research team reviewed the responses and made changes and additions to the statements based on the feedback before conducting the consensus rounds. A wider group of participants were invited to take part in these additional rounds. The final list of statements at the end of the consensus rounds informed the new measure, which the research team have called the Positive and Negative Sleep Appraisal Measure (PANSAM).

When devising the final list of items to include on the PANSAM for the subsequent studies, the research team included the statements that reached high consensus in the Delphi study (See Appendix 7). These statements represented each of the four subscales
fairly evenly: 1) positive appraisals of sleeping less than usual (5 statements); 2) negative appraisals of sleeping less than usual (5 statements); 3) positive appraisals of sleeping more than usual (3 statements); 4) negative appraisals of sleeping more than usual (4 statements). In order to ensure that potentially important statements were not excluded, the remaining items from the Delphi study were reviewed by the research team. Any items that were duplicates (e.g. “I sleep less to give myself a lift” and “When I know there is something difficult coming up, I sleep less to give myself a lift”) were summarised as one statement. These items were then put back into the measure. This resulted in the final version of the PANSAM used in the subsequent studies having 33 statements (See Appendix 8). The subscales for this measure were nearly even, with 8 statements in each subscale except for 9 statements in the subscale for positive appraisals of sleeping less than usual.

2.2.3. Validating a Questionnaire

A newly developed measure needs to be tested for validity and reliability in order to assess its usefulness in subsequent work. Validity represents whether the PANSAM measures what it is intended to measure while reliability represents the consistency of the measure’s results (Field, 2009; Tsang et al., 2017). This is what the second aim of this thesis set out to do with the PANSAM. The Pilot Study and Studies 3, 4, and 5 each contributed towards initial validity and reliability testing.

2.2.3.1. Validity

Two types of validity are content and construct validity. Content validity refers to whether the PANSAM is representative of the theoretical construct it is intended to measure whereas construct validity is the ability of the PANSAM to measure the constructs it has set out to measure (Tsang et al., 2017). Described below are the aims of this thesis to test content and construct validity.

2.2.3.1.1. Content Validity

Recent guidelines for assessing the content validity of patient reported outcome measures advise that qualitative work should be conducted with a sample representing the target population for who the measure is intended for (Terwee et al., 2018) as well as evaluation by experts (Boateng et al., 2018). As discussed above, the development and consensus rating of the appraisal statements were conducted with professionals in the field of BD, thus maximising capturing a range of positive and negative sleep cognitions based on their clinical or research experience. In addition, when devising the initial statements for review
by the professionals, the author (LP) had reviewed an online BD forum for themes from people with lived experience of mood and sleep difficulties. No additional input from service users were included at this development stage however, and so it is a limitation of the PANSAM that more service user input was not captured qualitatively. Unfortunately, a balance needed to be struck with beginning the development of the PANSAM for use with the remaining studies whilst also endeavouring to conduct high quality research. For this reason, a Pilot Study was conducted with participants who have lived experience of high and low mood states to assess comprehensibility and relevance of the PANSAM with the BD spectrum (face validity) (Please see Appendix 1 and 2 for both the PANSAM and DBAS participant feedback form responses). In addition, these participants also compared the PANSAM with the more commonly used DBAS measure for insomnia that has been used in BD sleep research.

2.2.3.1.2. Construct Validity

In order to determine construct validity, the three approaches described below were undertaken. These are reduction analysis, convergent validity, and discriminant validity.

2.2.3.1.2.1. Reduction Analysis

2.2.3.1.2.1.1. Aim 2.1 / Study 3: Explore the factor structure of the sleep cognition measure

One method of determining construct validity is reduction analysis. This was conducted in Study 3 in order to determine if there are one or more latent constructs (or subscales) of highly correlated statements. This analysis enables reducing the measure by removing statements that are not associated with the other ones and by identifying the relevant subscales that can be used to represent observed variables. Reduction analysis is considered to increase external validity which makes the measure more likely to be replicated in future work (Henson & Roberts, 2016).

2.2.3.1.2.2. Convergent Validity

2.2.3.1.2.2.1. Aim 2.2 / Study 3: Review the construct validity of the sleep cognition measure with validated measures representing BD personality, mood, sleep, and cognitions relevant to both mood and sleep

Convergent validity represents how correlated the PANSAM is with other variables in directions we would expect. Studies 3, 4 and 5 each report the correlations of the PANSAM and/or its subscales with validated measures that measure constructs we expect
should be correlated with the PANSAM. We hypothesise (Study 3 / Hypothesis 2.2.1) that the PANSAM will be positively associated with high and low mood tendencies, poor sleep quality, and cognitions that maintain both sleep disruption and shifts in mood. Appropriate validated measures assessing for these constructs were included in each study and correlations are reported. These measures will be explained in more detail below in the “Assessments” section.

2.2.3.1.2.3. Discriminant Validity

2.2.3.1.2.3.1. Aim 2.3 / Study 4: Test the sleep cognition measure in line with the ICM by comparing individuals who experience both elevated and depressed mood states (a BD spectrum group) with two control groups (unipolar depression group and non-clinical groups).

Tsang et al. (2017) highlights that the guidelines explained above for validating a measure are only the initial validation steps. An important additional analysis is to test the ability of the scale to discriminate between different groups. This was achieved in Study 4 which compared the PANSAM across three different groups of participants: those who met BD spectrum criteria, those who met unipolar depression criteria, and a nonclinical control group. There were several hypotheses for this study. The first hypothesis (2.3.1) was the BD spectrum group will score higher than the two control groups on the overall PANSAM mean, due to their increased vulnerability to the wide range of sleep disturbances. Two secondary hypotheses were also tested for investigating comparison with the validated DBAS and HAPPI. Hypothesis 2.3.2 expected the overall DBAS mean would be significantly higher in both the BD spectrum group and the unipolar depression group compared to the non-clinical group. Hypothesis 2.3.3 expected the overall mean for the HAPPI would be significantly higher for the BD group than both the unipolar depression group and the non-clinical group.

2.2.3.2. Reliability

There are different ways of evaluating a measure’s consistency. The first is internal consistency, or the extent to which the PANSAM items are inter-correlated (Tsang et al., 2017). This is commonly reported by the Cronbach’s alpha ($\alpha$) which ranges from 0 (no internal consistency) to 1 (perfect internal consistency). Internal consistency for the PANSAM and its subscales are reported in Studies 3, 4, and 5. Tsang et al. (2017) recommends estimating reliability at all validation stages for a new measure since $\alpha$ is not
necessarily representative of reliability under all circumstances and may change when administered with a different population.

Test-retest is a second form of reliability which assesses how consistent the PANSAM scores are across repeated administration (Field, 2009). This is important for attributes that would be expected to remain stable, such as personality traits or attitudes. The test-retest reliability is evaluated with the Pearson’s product-moment correlation coefficient (Pearson’s r). The research team expected that the sleep cognitions measured by the PANSAM should remain relatively stable over time, and so the test-retest is reported in Study 5 (Diary Study). In this study, all participants completed the measure twice with a two week period in between administration.

### 2.3. Testing the Proposed ICSM

In order to begin testing the proposed ICSM, different quantitative methodologies were employed. These were cross-sectional studies and a prospective, diary study.

#### 2.3.1. Cross-Sectional Methodology

Cross-sectional methodology is observational in design, with all data points taken at a single point in time for each participant. This type of methodology enables associations to be explored, rather than causation. The advantages to a cross-sectional design include the study can be quick, easy, and cheap to deliver. Additionally, since participants take part at only one time-point there is no loss to follow-up. A disadvantage of this methodology is non-response bias. This is when participants who take part may differ in important ways to those who did not take part in the study (Sedgwick, 2014). In the ICM research using the HAPPI, cross-sectional studies with analogue samples have been successfully conducted and shown important associations between extreme appraisals and mood symptoms as detailed in the review by Kelly, Dodd, and Mansell (2017). For this reason, Study 3 was deemed to be an appropriate methodology for capturing an analogue sample and exploring associations. Study 4 is an additional cross-sectional study with different clinical groups and a non-clinical group. Study 4 follows similar methodology to a previously conducted ICM study assessing associations between appraisals and mood symptoms across multiple groups (Mansell et al., 2011).

#### 2.3.2. Diary Methodology

#### 2.3.2.1. Aim 3.2 / Study 5: Test if the PANSAM predicts a person’s sleep shifting from short to long duration sleep disturbances, night by night
Retrospective assessments are typically used in psychology research, such as measures that ask the participant to rate symptoms or experiences that occurred in the previous week or month. Unfortunately retrospective recall can lead to inaccuracies. One way to overcome this is by using a diary approach. The diary approach methodology enables a person to document experiences in close proximity to the event, reducing the recall inaccuracies. In addition, the diary approach enables assessing within-person variability (Bolger, Davis, & Rafaeli, 2003). This methodology was chosen for Study 5 in order to more robustly test if the PANSAM predicts a person’s sleep shifting from short to long duration sleep disturbances, night by night. The hypothesis (3.2.1) for Study 5 is higher mean scores on the PANSAM will predict higher rates of subjective and objective TST variability.

2.3.3. Predictive Validity Tests

In both the cross-sectional and diary methodologies, predictive validity tests were employed. These were hierarchical regressions to test the incremental validity of the PANSAM. These tests were each designed to test the proposed ICSM (Research Aim 3) but also link in with Research Aim 2 for continuing to provide further checks on validity. Predictive and incremental validity testing is in line with the proposed guidelines in both Boateng et al. (2018) and Tsang et al. (2017). Research Aim 3.1 (Study 3) aimed to conduct a hierarchical regression to explore the PANSAM’s incremental usefulness with a validated sleep quality measure, with additional variables entered in the regression that were age, gender, BD tendency and the commonly used DBAS measure. Research Aim 3.3 (Study 5) aimed to conduct another hierarchical regression with more robust measures of sleep as the dependent variable. These more robust measures were the subjective and objective TST variability.

2.4. Assessments

Different assessments for determining the variables of interest for this thesis were included in the pilot study and Studies 3, 4 and 5. These assessments are for low and high mood states, sleep, cognitions related to sleep and mood, and anxiety. The assessments include validated self-report measures, researcher led interviews, and a subjective (sleep diary) and objective (actigraphy) assessment for measuring sleep.

2.4.1. Mood Assessments

The researcher-led Structured Clinical Interview for the DSM-IV Axis I Disorders (SCID;(First, Spitzer, Gibbon, & Williams, 2002)) was administered in Study 4 (Clinical
study) in order to thoroughly assess for high and low mood and additional mental health disorders including psychosis and anxiety experiences. The author (LP) is trained in administering this interview and has received regular supervision alongside conducting it with participants who have taken part on different clinical trials not attached to this thesis. The use of the SCID was to confirm diagnosis for the purposes of inclusion and exclusion criteria for Study 4. In addition to this diagnostic interview, validated mood measures were included in the studies. The Internal States Scale (ISS; (Bauer et al., 1991) was used in Studies 3, 4, and 5 in order to assess for bipolar symptomology in the past 24-hours. The subscales of the ISS are activation (e.g. racing thoughts), depression (e.g. global pessimism), perceived conflict (e.g. irritability), and psychological well-being (e.g. feeling good). The ISS has consistently shown to discriminate mood states in BD (Bauer, Vojta, Kinosian, Altshuler, & Glick, 2000) whilst also measuring analogue hypomania and depression symptoms in non-clinical populations in ICM research (Dodd, Mansell, Beck, & Tai, 2013; Dodd, Mansell, Morrison, & Tai, 2011b; Dodd, Mansell, Sadhnani, Morrison, & Tai, 2010; Kelly et al., 2011; Mansell, Rigby, Tai, & Lowe, 2008).

Alongside the ISS, additional measures for high and low mood were included. The Beck Depression Inventory (BDI; (Beck, Steer, & Garbin, 1988) was chosen as the self-report measure of choice for assessing depression across the previous two weeks. The BDI was developed based on clinical observations of attitudes and symptoms of patients with depression and has been shown to be a reliable and valid measure of depression in both clinical and non-clinical populations. Unfortunately, due to the cost and availability of the BDI this measure could only be used with one study and so was included in the battery of assessments for the clinical study (Study 4). The use of the BDI for this study was through the purchase of the measure for the Bipolar at Risk Trial (BART) (REC Ref: 15/NW/0336)) that Sophie Parker (supervisor) was chief investigator and the author (LP) was a research assistant for. Copies of the BDI had been purchased for use with BART and there were enough remaining copies for use in Study 4. The BDI was administered following completion of the current/past depressive episode section of the Structured Clinical Interview for Axis-I Diagnoses (SCID). This enabled the author (LP) to review item 2 (hopelessness) and item 9 (suicide ideation) with the participant to assess for risk.

Due to the limited available copies of the BDI for use with this thesis, an alternative depression measure was required for Studies 3 and 5. The Patient Health Questionnaire-9 (PHQ-9) was chosen as an appropriate alternative since there are no fees or permissions required for using the measure and it is used in both clinical and research settings. In
addition, a recent meta-analysis concluded the PHQ-9 is a valid instrument to detect a major depressive episode (Wittkampf, Naeije, Schene, Huyser, & van Weert, 2007).

In order to measure high mood tendencies for Studies 3 and 5, the Hypomanic Personality Scale (HYP) was chosen. Studies 3 and 5 were conducted with participants from the general population and so the HYP was deemed to be appropriate since it measures for hypomanic personality traits that could be elevated in those who are considered a high-risk group for BD and has been validated in a student population (Eckblad & Chapman, 1986).

For study 4 (Clinical study), the Young Mania Rating Scale (YMRS; (Young, Biggs, Ziegler, & Meyer, 1978) was used instead of the HYP. The YMRS is a researcher led interview that was completed following the high mood module of the SCID. The YMRS items are based on the participant’s subjective report of their high mood symptoms over the past 48-hours and on the researcher’s observations of the participant’s behaviour in the assessment. The YMRS was chosen for the clinical study since it measures the manic ‘state’ rather than traits that the HYP assesses for. Additionally, the bipolar at-risk criteria (BAR) that was included in the inclusion criteria for Study 4 includes the YMRS (Bechdolf et al., 2010).

2.4.2. Sleep Measures

Two sleep researchers (Simon Kyle and Lee Mulligan) both provided separate advice about sleep related measures for use in studies 3, 4 and 5. Based on their advice, the following measures were chosen. The Pittsburgh Sleep Quality Index (PSQI; (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) is the most commonly used standardised measure of sleep quality that discriminates between “good” and “poor” sleepers in both clinical and research settings. It was not developed with a particular population in mind, but has been used with healthy subjects (Buysse et al., 1991) and those with BD (Keskin, Tamam, & Ozpoyraz, 2018). For these reasons, the PSQI was determined as the most appropriate self-report sleep measure for the aims of this thesis, and was included in Studies 3, 4, and 5. An additional variable for assessing sleep distress was added as a standalone question following the PSQI with a rating scale of 0 (not at all distressed) to 100 (very much distressed). The Insomnia Severity Index (ISI; (Morin, Belleville, Belanger, & Ivers, 2011)) was also considered as a measure to include, as this assesses the severity of both nighttime and daytime components of insomnia. However, it was agreed by the research team that since insomnia is not the sole focus of this research it was not necessary to include.
For Study 5 (Diary Study), two additional measures of sleep were included in order to measure sleep variability. The first is the Consensus Sleep Diary (Carney et al., 2012), which gathers information about a person’s daily sleep pattern and is a subjective measure of sleep. This diary was developed by a team of insomnia experts with the intention of creating a standardised sleep diary for both clinical and research use. A particular strength of this diary is the input during the development stage from patients and those who would use the diary. Although it is intended primarily for insomnia research, the researchers do note the diary is appropriate for clinical or research purposes that include different sleep disorders. For the purposes of Study 5, the diary was suitable since we calculated sleep variability from total sleep time that was recorded on the diary. The objective measure for sleep was recorded with an actigraph watch which measures wrist movements in order to assess either an awake or sleep state. Although polysomnography (PSG) is considered the gold standard for measuring sleep (Kryger, Roth, & Dement, 2017), actigraphy is more cost-effective and convenient for use in clinical and research work. Research has also shown actigraphy is a useful and valid means of estimating total sleep time (Marino et al., 2013) and has shown few statistical or clinical significant differences with PSG in those with insomnia and depression (McCall & McCall, 2012). Lee Mulligan provided guidance on how to collect and analyse the data from the actigraphy watches. The author (LP) also attended the Oxford Summer Sleep School in 2017 and was able to gain further guidance from this research team.

2.4.3. Cognition Measures

In the absence of a sleep cognition measure that assesses for the construct of positive and negative sleep cognitions in the context of fluctuating sleep disturbances, the Hypomanic Attitudes & Positive Predictions Inventory (HAPPI) (Mansell, 2006) was used as a guide for developing the PANSAM. As discussed in the first chapter, the HAPPI was developed alongside the ICM in order to measure the extreme and conflicting positive and negative appraisals of high and low activation internal states that define the BD spectrum. The HAPPI was included in Studies 3, 4 and 5 for both construct validity with the PANSAM and to also compare findings with the HAPPI in previous research conducted in the field of the ICM. There are additional measures that assess appraisals of internal states that have been used in the ICM research. These measures include the Hypomania Interpretations Questionnaire (HIQ; (Jones, Mansell, et al., 2006), which measures positive self-referent appraisals of hypomania-relevant experiences, and the Interpretations of Depression Questionnaire (IDQ; (Jones & Day, 2008)), which measures negative appraisals of
depression-relevant experiences. These measures were not deemed necessary to include since they are not based on the ICM, and thus do not assess the combination of positive and negative appraisals that the PANSAM has set out to do for sleep-related appraisals.

For a sleep cognition measure, the Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS) (Morin et al., 1993) was chosen for the pilot study and Studies 3, 4, and 5. The DBAS is a sleep cognition measure for insomnia and has been used in BD research (Chang et al., 2018; Harvey et al., 2005). As will be discussed in Study 1, there were no identified cognition measures for hypersomnia or reduced need for sleep. For this reason, although the DBAS is insomnia specific it is also the most commonly used dysfunctional sleep belief measure and thus provides the best basis for comparison to the PANSAM. There are several different versions of the DBAS. The measure was initially developed with 28 items (Morin et al., 1993). Two items were later added, making the DBAS-30. There is no published record of the addition of these two items, and this measure was only obtained by the author (LP) from the developer of the DBAS, Charles Morin, upon e-mail request. Using the DBAS-30, two shortened versions were developed. The DBAS-10 was developed based on the items that have the most significant change at post-treatment following CBT-I (Espie, Inglis, Harvey, & Tessier, 2000). The DBAS-16 was developed in order to provide an abbreviated version that would encourage more widespread clinical and research use (Morin et al., 2007). The DBAS-28 was the version used for the subsequent studies in this thesis since this is the full measure with published evidence of the factors that each of these items load onto.

2.4.4. Anxiety

For Study 4, a measure for anxiety was included in order to assess for levels of anxiety across the different participant groups. Although the SCID was administered in full to confirm the non-clinical control group, the anxiety module was not administered to those participants who met criteria for a mood disorder. This was due to time constraints, since the full completion of the SCID interview can last longer than one hour with a participant who meets clinical criteria for a range of disorders. For this reason, the brief, self-report Generalised Anxiety Disorder-7 (GAD-7) was included. Although the GAD-7 focuses only on the one anxiety disorder (rather than different anxiety disorders such as social phobia or posttraumatic stress disorder), GAD is one of the most common mental disorders (Spitzer, Kroenke, Williams, & Lowe, 2006). For this reason, the GAD-7 was considered an appropriate measure representing anxiety across the participants.
2.5. Samples & Recruitment

The aims of the studies in this thesis required a range of different participants for each. Clinical and research professionals with experience in the field of BD were invited to take part in Study 2 (Delphi study) for providing suggestions, feedback and consensus on the PANSAM items. The Pilot Study recruited service users with lived experience of high and low mood states to provide content validity feedback on the PANSAM and compare relevance with the validated DBAS measure. Study 4 (Clinical study) recruited for two clinical groups of participants (those who met BD spectrum criteria and unipolar depression) and a non-clinical control group in order to test whether the PANSAM can distinguish between these different groups of people. The author (LP) conducted recruitment for these studies using links with the Greater Manchester Mental Health NHS Trust she is currently employed with. Whilst conducting this thesis and related studies, LP was working on BART which was a National Institute of Health Research funded clinical trial conducted within the Trust at the Psychosis Research Unit. This meant LP had strong contacts at local services such as Community Mental Health Teams and Primary Care Psychology. Additionally, participants who had finished taking part in BART and agreed to be contacted about future research were informed via an opt-in slip about the Pilot Study and Study 4.

Studies 3 and 5 recruited for a convenience, analogue sample. Recruitment was focused at the University of Manchester and also advertised on social media (Facebook and Twitter). Study 3 was an online study, which meant people outside of the local Manchester area were able to take part. The ICM and the ICSM both propose that mood and sleep fluctuations occur on a continuum from non-clinical experiences to the more extreme end in which clinical mood or clinical sleep disorder episodes occur. In addition, analogue samples were successfully used in the ICM and HAPPI research (Kelly et al., 2017). For these reasons, analogue samples were deemed appropriate for exploring the relationships between non-clinical bipolar and sleep experiences and the extreme appraisals captured on the PANSAM.

2.6. Ethical Approval

Studies 1 and 2 did not require ethical approval. Ethical approval is not required when conducting a review of the literature (Study 1). Regarding Study 2, the university research ethics committee did not require ethical approval since this study only asked professionals non-sensitive questions deemed strictly within their professional competence. Additionally,
personal identifiable data was not collected from the participants. The remaining studies did require ethical approval. The Pilot Study was submitted as an amendment for ethical approval under the BART study (REC Ref: 15/NW/0336) and was granted permission. The work conducted in the Pilot Study and the remainder of this thesis will help to inform what validated measures about sleep might be useful to include in a future BART related trial. Sophie Parker will act as custodian of this research data. The anonymised paper based data will be stored in accordance with the BART data at an NHS site and the electronic data will be stored on an NHS password-encrypted computer. Studies 3 and 5 received ethical approval from the University of Manchester (Ref: 16314) with Research Ethics Committee 2. Warren Mansell will act as custodian of this research data. The anonymised paper based data for these studies will be stored for a minimum of 10-years in a locked filing cabinet at the University of Manchester and the electronic data will be stored on a password-encrypted University of Manchester issued computer. Finally, Study 4 received full ethical approval from the NHS East of Scotland Research Ethics Group (REC Ref: 17/ES/0140). Sophie Parker will act as custodian of this research data. The anonymised paper-based data will be stored for a minimum of 5-years in an NHS locked filing cabinet and electronic data will be stored on a password-encrypted NHS computer.

2.7. Summary

This chapter has provided an overview of the methodologies employed throughout this thesis. The individual studies will now be discussed in detail as separate chapters.
3. Beyond insomnia: A scoping review of self-report sleep cognition questionnaires for sleep duration disturbances

The following review is currently being amended to meet the requirements for submission to the Sleep Medicine Review journal.
Beyond insomnia: A scoping review of self-report sleep cognition questionnaires for sleep duration disturbances

Lydia Pearson\textsuperscript{1,2}, Warren Mansell\textsuperscript{1}, Elizabeth Turner\textsuperscript{1}, & Sophie Parker\textsuperscript{1,2}

\textsuperscript{1}School of Health Sciences, University of Manchester, Manchester UK
\textsuperscript{2}Greater Manchester Mental Health NHS Foundation Trust

Correspondence concerning this article should be addressed to:

Lydia Pearson
Psychosis Research Unit, Rico House, Greater Manchester Mental Health NHS Foundation Trust, Trust Headquarters, Bury New Road, Prestwich, Manchester, M25 3BL
Tel: +44 (0)161 358 1395
Email address: Lydia.Pearson@gmmh.nhs.uk

The authors declare no conflicts of interest with respect to this publication.
This research received no specific grant from any funding agency, commercial or not-for-profit sectors.
The authors have abided by the Ethical Principles of Psychologists and Code of Conduct as set out by the APA.
3.1. Abstract

The objective of this scoping review was to identify cognition measures for excessively long or short sleep duration disturbances (insomnia, hypersomnia, and reduced need for sleep) that have been developed for clinical or research purposes. This is in the aim of informing transdiagnostic sleep research and clinical practice. Two authors undertook screening for the inclusion/exclusion criteria and one author extracted the relevant measures from the articles. The search returned 1,399 articles and 41 measures met the inclusion criteria. Results indicated that the majority of measures were intended for an insomnia population (n=36). The theories underpinning the measures were reviewed, with Harvey’s Cognitive Model of Insomnia cited the most as informing a measure (n = 10). Cognitions associated with insomnia tend to describe the negative features of reduced sleep duration. An item level analysis was conducted to identify items that may describe cognitions or attitudes associated with hypersomnia (extending sleep) and reduced need for sleep (reducing sleep). Sleep hygiene and arousal belief and attitude items were found to be most directly applicable. Self-efficacy and control measures could also apply. In conclusion, more attention should be focused on understanding the cognitions that may be maintaining a range of sleep duration disturbances.
3.2. Introduction

Sleep is an essential, basic human need that is vital to overall good health and wellbeing. Unfortunately, roughly 30% of the general population are reported to suffer from a sleep disturbance, resulting in poor quality sleep (Klink, Quan, Kaltenborn, & Lebowitz, 1992; Morin, LeBlanc, Daley, Gregoire, & Merette, 2006; World Health Organization Regional Office for Europe, 2004). Indicators of sleep disturbances include difficulties with falling and maintaining sleep, total sleep time, nightmares, and reporting poor quality and unrefreshing sleep. These sleep disturbances and resulting poor quality sleep have a negative impact on one’s mood, motivation, and cognitive functioning often resulting in an increase in the use of health services and time off from work (Roth & Ancoli-Israel, 1999).

Sleep disturbances commonly occur with mental health difficulties (Benca, Obermeyer, Thisted, & Gillin, 1992; Krystal et al., 2008; Ohayon, Shapiro, & Kennedy, 2000) and are both clinical symptoms (American Psychiatric Association, 2013) and recognised in the clinical presentation of mental health disorders. In particular, the rate of insomnia (difficulty falling and staying asleep) has been reported as a symptom across at least half of the disorders in the Diagnostic Statistical Manual (DSM) (Roth et al., 2006). Due to this high co-occurrence, sleep disturbance is increasingly recognised as a clinical entity in its own right and an important mechanism in the onset and course of mental health difficulties (Harvey, 2008a; Harvey et al., 2011).

As noted above, there are a range of different sleep disturbances present across the mental health disorders. Although there is no single sleep variable found to be specific across all of the disorders, Benca et al. (1992) highlighted that those with affective disorders differed most frequently and significantly with sleep disturbance as compared to nonclinical participants. Affective disorders are also known as mood disorders and include depression, bipolar disorder (BD), and anxiety disorders. Impaired total sleep time represents the most common sleep disturbance that is a clinical symptom, or recognised in the clinical presentation, across the affective disorders. Sleep disturbances characterised by impaired total sleep time include insomnia, hypersomnia (excessive sleepiness (American Psychiatric Association, 2013)), and reduced need for sleep (difficulty sleeping even with adequate opportunity to sleep (Harvey, 2009)).

These impaired total sleep time disturbances not only co-occur with mental health disorders (Ohayon et al., 2000; Stein, Kroft, & Walker, 1993), but evidence is mounting that they present in the at-risk symptomology and predict the onset of mental health relapse (Scott, 2011). For example, sleep disturbance indicative of insomnia reported before
exposure to a traumatic event significantly increases the risk of developing depression and post-traumatic stress disorder (Bryant et al., 2010; Krakow et al., 2001). Insomnia has also consistently been shown to be a significant risk factor for the onset and recurring episodes of depression (Breslau et al., 1996; Ford & Kamerow, 1989; Johnson et al., 2006; Perlis et al., 2006) in both major depressive disorder and BD.

The rate of hypersomnia has been reported as occurring as much as 75% across mood disorders and predicts the onset of a depressive episode (Kaplan & Harvey, 2009). For those with BD, hypersomnia has been reported 25% (Kaplan et al., 2011) to 50% when in an inter-episode state, and up to 67% when in a depressed state (Steinman et al., 2016). Hypersomnia has also been reported by individuals who are in clinical remission from depression but do not subjectively believe they are in remission (Zimmerman et al., 2005). This has suggested that hypersomnia may represent a more severe course of depression for some people which is recognised as atypical depression. Atypical depression is associated with higher rates of depressive symptoms, suicidal thoughts and attempts, and co-occurrence with anxiety disorders including panic disorder and social phobia (Matza et al., 2003).

Regarding reduced need for sleep, in a systematic review by Jackson et al. (2003) the symptoms reported by people with BD before the onset of a mood relapse were explored. The review highlighted that sleep disturbance was the most commonly reported early symptom occurring before the onset of mania. Sleep disturbance linked with the onset of high mood has been corroborated in a retrospective study by Correll et al. (2007) in which 39% of patients with BD reported reduced need for sleep as a symptom prior to developing a manic episode. With previous reported rates of relapse for those with BD as high as 50% within one year (Perlis et al., 2006) and nearly 100% within four years (Tohen, Waternaux, & Tsuang, 1990; Tohen, Waternaux, Tsuang, & Hunt, 1990) it is important to best understand options of intervention for those experiencing mood and sleep difficulties.

The evidence of sleep disturbance preceding and co-occurring with mental health disorders has led to it being considered a common clinical feature. This is referred to as a transdiagnostic process since it contributes to the maintenance of symptoms across a range of disorders (Harvey, 2008a; Harvey et al., 2016; Harvey et al., 2011). The benefits of understanding a transdiagnostic process mean that interventions can be developed targeting co-occurring disorders rather than a specific disorder. This then could reduce comorbid symptoms whilst enabling clinicians to follow one treatment protocol targeting sleep.
problems rather than multiple treatment protocols (Harvey et al., 2004; Norton & Barrera, 2012).

Cognitive behaviour therapy is an established and evidence-based psychological intervention for many disorder-specific difficulties (e.g. anxiety, depression). Regarding sleep disturbance, the clinical focus has been on Cognitive Behaviour Therapy for Insomnia (CBT-I) as a potential transdiagnostic intervention since insomnia is so prevalent across the mental health disorders (Smith, Huang, & Manber, 2005). Studies have shown that CBT-I improves insomnia symptoms whilst also improving the symptoms of the comorbid disorder (Manber et al., 2008; Myers, Startup, & Freeman, 2011; Wu et al., 2015). Since insomnia is only one type of sleep disturbance, Harvey (2009) proposed a transdiagnostic intervention protocol for sleep disturbances that is a modification of CBT-I (Harvey et al., 2016) This protocol is comprised of core modules that apply to the vast majority of patients and optional modules that can be incorporated based on the patient’s sleep disturbance presentation. This approach enables a clinician to target specific sleep disturbances, such as hypersomnia and reduced need for sleep, which both have received less clinical attention than insomnia.

In order for an intervention to be effective, a validated theory developed from clinical observations and experimental investigations should be used to identify maintaining processes (Salkovskis, 2002). For insomnia, research and theory have highlighted maintaining cognitive processes that involve worry or rumination, attentional and interpretative biases, unhelpful beliefs about sleep, and conditioned safety behaviors (Harvey, 2002a; Morin, 1993), which are then identified and targeted in CBT-I. In order to best identify these cognitions for research and clinical purposes, a self-report measure is required. Since a transdiagnostic sleep intervention accounts for a range of sleep disturbances, it is important for clinicians and researchers to know the measures available for use with these optional modules and the theories underpinning them. To achieve this, a review of the literature can identify, evaluate, and summarise the findings of relevant information and self-report measures and highlight any gaps in the literature or research field.

3.2.1. Purpose of study

This scoping review set out to discover the range of self-report sleep cognition measures discussed in the literature for the sleep disturbances insomnia, hypersomnia and reduced need for sleep. This will build on a previous review that looked at the available insomnia specific measures (Hiller, Johnston, Dohnt, Lovato, & Gradisar, 2015) that fit with the
cognitive model of insomnia (Harvey, 2002a), to ensure that transdiagnostic sleep research and interventions include research and measures relevant for the complexity of sleep disturbances experienced. The theoretical perspectives for the measures and their individual items will be analysed for relevance with the range of sleep duration disturbances to identify if there are any gaps in the literature to help inform future research and clinical practice.

3.3. Methods

3.3.1. Overview

In line with the framework for conducting scoping reviews proposed by Arksey and O'Malley (2005), this review has included the following steps: 1. Defining the research question, 2. Identifying relevant studies, 3. Study selection, 4. Charting the data, and 5. Collating, summarizing, and reporting the results.

3.3.2. Research question

What sleep cognition self-report measures have been developed for clinical or research purposes for people experiencing sleep duration disturbances including insomnia, hypersomnia, and reduced need for sleep?

3.3.3. Identification of relevant studies

The research team (LP, SP, & WM) developed the database search strategy. This consisted of four groups of search terms combined with the Boolean operator ‘AND’, and represented the following components: 1. Sleep, 2. Cognitions, 3. Measure, 4. Psychometric. There were no limitations on publication date and only articles in English were accepted. An electronic search was last conducted through the interface OVID for Medline, Embase, and PsychInfo in July 2018. The records were exported into a master Endnote library and duplicates were removed. Second sourcing was conducted to ensure relevant papers missed from the database search were included. This involved reviewing the reference list for an accepted sleep cognition measure and contacting the author(s) for any accepted sleep cognition measure with limited information (e.g. a conference abstract). The search strategy is outlined in Table 1.
Table 1. Study 1, Terms used for electronic database search

<table>
<thead>
<tr>
<th>Component</th>
<th>Search Terms</th>
</tr>
</thead>
</table>
| Sleep     | exp sleep [MeSH]  
or  
sleep* OR dyssomn* OR insomn* OR hypersomn* OR somno* OR wakeful* OR circadian* [key]  
or  
Reduc* adj2 need* adj2 sleep* [key] |
| Cognitions | Belief* OR apprais* OR thought* OR percept* OR cognit* styl* OR cognit* OR interpret* OR attitude* OR assumpt* OR cognit* process* OR conviction* OR self-efficac* OR self efficac* OR metacognit* OR meta-cognit* OR preoccupation* OR attribut* OR worr* OR arous* OR effort* OR rumin* OR anticipat* OR aware* OR think* OR emot* OR affect* OR motiv* OR disinhib* OR reward*[title]  
or  
Locus* adj2 control*[title] |
| Measure   | Measur* OR scale* OR assess* OR self-report* OR self report* OR question* OR survey* OR tool* OR inventor* OR instrument* OR outcome* or interview* OR test*[title] |
| Psychometric | psychometric* OR valid* OR reliab* OR un reliab* OR coefficient* OR internal consist* OR alpha* OR correlation* OR inter-rater* OR interrater* OR intrarater* OR intra-rater* OR kappa* OR general* OR correlation* OR develop*[key] |

3.3.4. Study selection

The database searches retrieved a total of 1,399 records. After duplicates were removed, a total of 923 articles remained. Two independent reviewers (LP, ET) performed the selection of titles, abstracts, and full-text articles following the agreed inclusion and exclusion criteria. These criteria stated that an accepted measure must be in the English language, self-report format, and aim to measure positive or negative sleep cognitions in the context of insomnia, hypersomnia or reduced need for sleep. Sleep cognitions could include, but were not limited to the following three areas: 1. negative cognitions such as catastrophizing thoughts, rumination, or worry, 2. positive cognitions about sleep that included positive emotion, reward motivation, or disinhibition, and 3. beliefs about sleep that fuel positive and negative cognitions such as beliefs about the sources of, consequences of, or potential treatments of sleep issues. Measures were not included that assess for sleep quality indicative of a sleep duration disturbance (e.g. Pittsburgh Sleep
Quality Index), measures in the context of different sleep conditions and disorders (e.g. sleep apnoea), measures in the context of a physical or medical condition (e.g. multiple sclerosis), or measures that assess for cognitive impairment.

The agreed protocol specified if an article was accepted by one reviewer and not the other, the study was retained for the next level of review. All publications of studies were included such as journal articles, books, conference publications, and theses. For conference abstracts, presentations, or development articles with limited information on the measure (e.g. measure not available) additional work of contacting the research team (as advised by McManus et al. (1998)) was undertaken to source the full paper or required information. At the full article level, all studies that mentioned a self-report measure meeting the inclusion criteria were accepted. This included articles that reported on the development or psychometric properties of a sleep cognition measure and also articles that referenced a sleep cognition measure. For every sleep cognition measure that was identified in all articles reviewed, the original study or peer-reviewed version for the measure was sourced from the reference list and either accepted or rejected. After each level of accepting or rejecting studies, a kappa value was calculated for inter-rater agreement. This agreement was considered at least “good” at each point (title level = .695; abstract level = .703; full article level = .834). Measures that were in disagreement were discussed with authors WM & SP for a final decision.

As a final step for compiling the studies used to inform the chart, author LP extracted only the accepted original or development articles for each identified accepted sleep cognition measure. This resulted in a total of 41 measures with 41 corresponding sources for the information. Several measures share the same article (Perceived Control of Sleep, Expectations of Sleep, and Attributions and Emotional Reactions) and three measures (Sleep Hygiene Awareness and Practice Scale, Views on Sleep Scale, and Daytime Functioning & Sleep Attribution Scale) had two references each. For one measure (Self-Efficacy Measure for Sleep Hygiene), information for the chart was obtained from the author directly due to insufficient details in the reference sourced.

3.3.5. Charting the data

A synthesis of information for each of the accepted measures was conducted by the author LP and incorporated into the chart (See Table 2). The key features of information included in the chart follow a descriptive-analytical model in which each measure was examined in relation to a common analytical framework (Pawson, 2002). These key features were discussed and agreed by the authors LP, SP, and WM. The aim of the agreed features were
to showcase the development of cognitive research for sleep duration disturbances, compare the intended purpose of each measure for ease in choosing an appropriate one for future research or clinical work, and highlighting gaps in the literature. The information recorded in the data chart include: measure name, summary of the measure, domains the measure taps into, the theory or theoretical model the measure was developed from, the development of the items included in the measure, the sleep duration disturbance the measure is intended for, the number of items and rating scale, and the country the measure was developed in.

3.3.6. Analysing the data

The theoretical perspectives underpinning the measures and related research were reviewed to identify those considering insomnia, hypersomnia, or reduced need for sleep specifically. In addition, an item level analysis was conducted of each of the available measures to identify positive and negative cognitions that are related to extending sleep (hypersomnia) and reducing sleep (reduced need for sleep). This will help to identify any gaps in the literature to inform future research and clinical practice for the range of sleep duration disturbances.

3.4. Results

3.4.1. Study selection

A flow diagram of the literature search and selection criteria is listed in Figure 6. The total number of studies included in the analysis, number, and reasons for exclusion are included.

3.4.2. Measure characteristics

The most common country of origin for a measure was the UK (n = 17), but measures were also developed in the USA (n = 12), Canada (n = 5), Australia (n = 2), and Norway (n = 1). There were also four measures with more than one location listed as the country of origin (Canada and USA; Spain & Italy; UK, USA, and Australia; UK and Germany).

The majority of these measures are intended for an insomnia population (n = 36) or for poor sleep suggestive of insomnia symptoms in the general population (n = 2). Several measures (n = 3) were specifically developed for a university student population and have been included in this review because the measure is intended to assess for cognitions related to poor sleep generally in this population but also suggested to be used with the
wider population. There are no measures reported to be intended for use with the sleep disturbances hypersomnia or reduced need for sleep.

Figure 6. Study 1, PRISMA 2009 Flow Diagram

3.4.3. Theory

The majority of the measures cite insomnia related theories or theoretical models. Prior to 2002, most of the measure development is based on a range of theories, models, and evidence pertaining to insomnia. These have been grouped as ‘theoretical conceptualisation of insomnia’ (n = 9). Inclusive in the theoretical conceptualisation of
insomnia are theories and models that have been identified specifically for certain measures. These are the performance anxiety model (n = 2), stimulus control (n = 2), a behavioural perspective (n = 2), the attention-intention-effort pathway (n = 2), and theory relating to elevated arousal (n = 1) including somatic arousal (n = 2), emotional arousal (n = 2), cognitive arousal (n = 4), and physiological arousal (n = 1). In 2002, both Harvey (2002a) and Espie (2002) published theoretical cognitive frameworks for insomnia. For the measures sourced for this review, Harvey’s cognitive model of insomnia is cited most frequently as the theoretical model underpinning the development of the measure (n = 10) whereas Espie’s is less (n = 3). In addition to the insomnia related theories, theory relating to thought control (n = 1) and generalised anxiety disorder (n = 1), the social learning theory (n = 1), self-regulatory executive function (S-REF) model (n = 2), social cognitive theory (n = 2), quality of life model (n = 1), health belief model (n = 1), theory of reasoned action (n = 1), transtheoretical model of behaviour change (n = 1), and theoretical framework of attitudes (n = 1) are cited. Despite the large number of theories and models that inform a cognitive framework for insomnia, none of them consider hypersomnia or reduced need for sleep.

3.4.4. Item Level

Only measures available in full (n = 36) were reviewed at an item level. Measures that were not able to be sourced in full (e.g. not all items included and attempts to source were not successful) are marked with an asterix on the chart (n = 5). Since the majority of the measures sourced are intended for insomnia, the focus of the item review was to identify cognitions that represented extending or reducing sleep that could be appropriate for hypersomnia or reduced need for sleep.

3.4.4.1. Hypersomnia

There were 10 measures in which statements explicitly represented extending sleep. These were SHAPS, DBAS/DBAS-10/DBAS-16, SRBQ, SPS, BSQ, DBAS-C10, and SPAQ. The statements included sleeping longer (n = 5; e.g. “Going to bed 2 hours earlier than the habitual hour / SBS), taking a nap (n = 5; e.g. “Daytime naps lasting for more than 2 hours / SBQ), and catching up on sleep (n = 5; e.g. “When I don’t get the proper amount of sleep on a given night, I need to catch up on the next day by napping or the next night by sleeping longer” / DBAS measures). Statements were also identified that were based on daytime effects of feeling tired (n = 9; “Are you usually tired during the day?” / SPAQ).

3.4.4.2. Reduced Need for Sleep
The CATS measure had statements (n = 4) explicitly written in the context of actively reducing sleep time. These included “I sleep less so I have more hours during the day to get work accomplished” and “I am inclined to skip sleep in order to socialise longer.” Similar behaviour statements were identified, although these had more of a focus on sleep hygiene behaviours that could result in reduced sleep. These measures were the SHAPS, SDQ, SBS, Beliefs about Sleep Questionnaire, and SPAQ. In these measures, there were statements about caffeine use (n = 3; e.g. “Consuming caffeine within 4 hours of bedtime.”), exercising prior to sleep (3; e.g. “Exercising to the point of sweating within 1 hour of bedtime.”), engaging in different activities (n = 10; e.g. “Doing important work before bedtime.”), keeping busy to block out thoughts (n = 3; e.g. “I try to block them out by reading a book, watching TV or listening to the radio.”) and general physical arousal (n = 2; e.g. “I don’t feel tired enough at bedtime.”). The SBS had one statement that assessed for going to bed later (“Going to bed 2 hours later than the habitual hour.”). In addition to statements representing actively engaging in physical behaviours or reducing sleep time through behaviours, mental alertness was also identified. The PSAS, SDQ, SDQ-Extended, DBAS / DBAS-10 / DBAS-16, SAAQ, NTTQ, Attributions & Emotional Reactions, TCQ-I, SAW, GCTI, and Beliefs about Sleep Questionnaire include statements (n = 19) such as “Being mentally alert, active” and “When I lie awake at night, my mind quickly skips from one thing to another.”

### 3.5. Discussion

Sleep is becoming increasingly recognised as a common process contributing to the maintenance of a range of mental health disorders. This has led to the development and implementation of a transdiagnostic sleep intervention (Harvey, 2009; Harvey et al., 2016). Although there has been a clinical focus on insomnia and CBT-I, a transdiagnostic sleep intervention will need to incorporate elements specific to a range of sleep disturbances that can present across the mental health disorders. The purpose of this scoping review was to survey the literature for available sleep cognition self-report measures that have been developed for people experiencing the sleep duration disturbances insomnia, hypersomnia, and reduced need for sleep. This is in the aim of ensuring a transdiagnostic psychological intervention can identify appropriate measures that represent maintaining cognitive features for a range of sleep disturbances.

This review has highlighted there is a significant gap in the literature and research field for understanding the cognitive processes maintaining hypersomnia and reduced need for sleep. The majority of the sourced measures are intended for an insomnia population, and
they evidence the development process that has been undertaken for decades into better understanding a cognitive framework for insomnia. Attention now should also be given to the other sleep disturbances. Salkovskis (2002) recommends clinical practice inform the development of theory, which can then be experimentally investigated for validation. This review has highlighted that for hypersomnia and reduced need for sleep, there are no theoretical conceptualisations available in the literature that are informing appropriate self-report measures and thus can inform suitable intervention approaches to incorporate into a transdiagnostic sleep protocol. The self-report measures and theories highlighted in the field of insomnia research, along with clinical observations, could be a potential starting point for addressing these additional sleep disturbances. The item level analysis has highlighted the range of cognitions that could be appropriate for all sleep duration disturbances, inclusive of hypersomnia and reduced need for sleep.

3.5.1. Sleep Hygiene

Sleep-hygiene related measures could be appropriate since sleep hygiene practices can be beneficial or disruptive to sleep generally (Lacks, 1987). For someone who is experiencing excessive sleepiness, the statements representing sleeping longer or napping could highlight practices or beliefs the person has that might be maintaining the sleep disturbance. Additionally, the items about “catching up” on sleep could be relevant for a BD population when insomnia and hypersomnia are often reported to occur within the same depressive episode. For reduced need for sleep, the hygiene items about caffeine use, exercising prior to sleep and engaging in different activities could be playing a role in elevating a person’s activation and thus reducing their need to sleep, which would be important for a clinician to be aware of and address.

3.5.2. Arousal

The items identified for keeping busy to block out thoughts, general physical arousal, and mental alertness all represent arousal which could be maintaining a reduced need for sleep disturbance. Arousal is particularly pertinent for those with BD, who are suggested to have a hypersensitive psychobiological system referred to as the Behaviour Activation System (BAS) (Alloy & Abramson, 2010). This system regulates motivation and goal-directed behaviour. For those with BD, the BAS can become overly activated by goal-related cues or rewards leading to (hypo)manic symptoms that include increased energy and decreased need for sleep. The CATS items could represent attitudes that are endorsed by those who experience elevated mood states and are engaging in goal-related behaviour. In addition, the NTTQ and SST:60+ both have items that assess for positive concerns and plans that
include assessing thoughts about important things, long-term plans and projects, and things
the person enjoys. The NTTQ items were not shown to be significantly increased in those
with insomnia (Watts, Coyle, & East, 1994), but it might be a relevant factor for those with
BD who experience reduced need for sleep. Alloy and Abramson (2010) recommend
clinicians support those along the bipolar spectrum with recognising and challenging
ambitious goal-setting and decrease goal striving in order to reduce elevated mood
experiences. The NTTQ and SST:60+ items could inform a clinician whether these
positive thoughts are occurring during a pre-sleep period, possibly activating the elevated
mood symptoms.

For those with hypersomnia, the items related to positive concerns and plans could be used
for a different purpose. Harvey (2009) proposes for the optional hypersomnia module in
the transdiagnostic sleep intervention protocol that clients reduce their sleep time. One way
to support this is to help the client establish goals that will encourage them to become more
engaged when awake. This is based on Harvey’s clinical experience that those with
hypersomnia often report not having anything to get up for (due to unemployment or a
breakdown in social networks), which reduces the persons motivation to get up and out of
bed. Items that represent positive plans or goals, found on both the NTTQ and SST:60+
could inform and aid further research in this area.

3.5.3. Beliefs / Attitudes

A range of the measures sourced in this review are comprised of beliefs or attitudes that
overlap with the different domains, such as arousal or worry. The UPWQ is one such
measure grounded in theory relating to generalised anxiety disorder. It is comprised of
positive and negative belief statements about worry in the pre-sleep period. The measure
assesses how much a person finds thinking or worrying about the items to be helpful and if
they enable the person to achieve the goal. Items include “to prepare for the future” and
“increases my awareness and this increases my performance.” Since there is a high
comorbidity of anxiety disorders with both major depression and bipolar disorder (Simon
et al., 2004) these beliefs or “meta-worry” may be relevant for those experiencing
hypersomnia and reduced need for sleep.

3.5.4. Control / Self-Efficacy

Finally, the measures that map across the control and self-efficacy domains could be useful
for hypersomnia or reduced need for sleep. Although these measures are intended for
control or self-efficacy of sleep in regards to insomnia related sleep difficulties, there are
some items that could pertain to sleep disruption as a whole. These include “lie in bed feeling mentally relaxed” (SES), “do you expect to be able to influence how long you stay asleep for” (PCS), and “I am directly responsible for my sleep” (SLOC).

3.5.5. Limitations

One limitation was our review was restricted to English language only publications, and we may have excluded important research in other languages. A second limitation was for our search criteria, we included a psychometric key word component which may have limited the scope of the measures we sourced. COSMIN recommends not including measurement properties in the search criteria if the aim is to find all available patient reported outcome measures (Mokkink et al., 2018). For the purposes of our search, however, we did go to extra lengths in order to best capture information missing from our search as advised by McManus et al. (1998). This included initially contacting a researcher in the sleep field for advice on sources of information, reviewing the reference lists of accepted articles, and contacting the authors of papers to obtain further information and up to date published articles.

3.5.6. Future Research

It is important for research using patient reported outcome measurements, such as the ones sourced in this review, are of a high quality. This will help to ensure that the research or clinical work conducted is valid and reliable. The purpose of this scoping review was to identify the measures that have been used in research previously, to identify what is available for clinicians and researchers moving forward and to highlight any gaps in the literature. We only reviewed the original development articles for each measure, which do not always adequately highlight tests of validity and reliability that may be done subsequently. A next step would be to conduct a systematic review of these patient reported outcome measures (or a selection of a particular subset) in order to determine the content validity of the measures using the new COSMIN guidelines (Mokkink et al., 2018). This will inform researchers and clinicians as to the more high quality and appropriate measures to use with patient groups.
Table 2. Study 1, Information synthesis of accepted measures

* = Measure not sourced in full for item level review

<table>
<thead>
<tr>
<th>Scale</th>
<th>Summary</th>
<th>Domain(s)</th>
<th>Theory or theoretical model</th>
<th>Development</th>
<th>Population</th>
<th>Items &amp; Rating scale</th>
</tr>
</thead>
</table>
| 1) **Sleep Anxiety Scale** (SAS) (Fogle & Dyal, 1983) * CDN | The SAS is designed to measure how much of a problem different aspects of sleep performance are (e.g. difficulty falling asleep) and how worried the person is about sleeplessness at different points of the bedtime routine and during the day. | Worry | Performance-anxiety model of chronic insomnia | Unknown | Insomnia | 8 items
For problems with sleep performance and worry, the participants rated each item on a 3-point scale from 1 (not a problem/not at all) to 3 (major problem/very much). Sleep-anxiety score is the sum of these ratings. |
<p>| 2) <strong>Pre-Sleep Arousal Scale</strong> (PSAS) (Nicassio, Mendlowitz, Fussell, &amp; Petras, 1985) USA | The PSAS has two arousal item subscales: 1) cognitive (e.g. “worry about falling asleep”) 2) somatic (e.g. “dry feeling in mouth or throat”) | Arousal | Theory that elevated arousal contributes to sleep-onset difficulties. | The authors derived the item content from clinical observations and interviews with service users. | Insomnia | 16 items (8 items each in somatic and cognitive subscales.) The participant rates the intensity of the arousal experience on a scale from 1 (not at all) to 5 |</p>
<table>
<thead>
<tr>
<th>3) <strong>Sleep Hygiene Awareness &amp; Practice</strong> (SHAPS) (Lacks, 1987; Lacks &amp; Rotert, 1986)</th>
<th>USA</th>
<th>The SHAPS awareness section assesses a person’s knowledge about which sleep hygiene activities are beneficial or disruptive to sleep (e.g. drinking alcohol in the evening) and which drink and food items contain caffeine (e.g. pain control medication). The practice section assesses how often the person engages in the sleep hygiene behaviours per week.</th>
<th>Sleep hygiene Beliefs</th>
<th>The activities listed in the hygiene knowledge section are known to have an effect on sleep.</th>
<th>Insomnia</th>
<th>Awareness section: 13 items assessing sleep hygiene knowledge. 18 food/drink items to assess caffeine knowledge. Practice section: 19 questions to assess sleep hygiene practice. Points are given if the answer is correct, omitted, or incorrect. Higher scores indicate less knowledge of sleep hygiene practices and less healthy sleep hygiene practice.</th>
</tr>
</thead>
</table>
| 4) **Self-Efficacy Scale (SES)** (Lacks, 1987) | USA | The SES was developed to measure one’s perception of their ability to control their sleep-related behaviour and motivation. This tool is intended to measure change in one’s perception of their ability to control sleep-related behaviour and motivation. | Self-efficacy | Theories: - Somatic arousal - Emotional arousal - Performance anxiety - Stimulus control - Cognitive arousal | Insomnia | 9 items Possible scores range from 9 to 45, with higher scores representing more confidence in ability to
related behaviour and motivation following a behaviour intervention. The items relate to mental and physical state whilst in bed, sleep efficiency, and reactions to sleep the following day.

<table>
<thead>
<tr>
<th>5) Sleep Disturbance Questionnaire (SDQ) (Espie, Brooks, &amp; Lindsay, 1989) UK</th>
<th>The SDQ is a clinical tool developed to assess the possible physiological (e.g. “My body is full of tension”), behavioural (e.g. “I spend time reading/watching TV in bed when I should be sleeping”), and cognitive (e.g. “I worry that I won’t cope tomorrow if I don’t sleep well”) factors of disturbed sleep. It is proposed the SDQ could be useful for planning individualised sleep treatments.</th>
<th>anxiety - Stimulus control - Cognitive arousal</th>
<th>Hazelwood (1983)</th>
<th>carry out the behaviour.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep</td>
<td>3 systems model: - Physiological overarousal - Cognitive overarousal - Behavioural perspective</td>
<td>The authors derived the item content based on their clinical experience.</td>
<td>Insomnia</td>
<td>12 items (3 items comprise each of the four subscales: physical tension; sleep incompatible behaviour, anxious “effort to sleep”, and cognitive intrusion.) The participant rates each item on a 5-point scale from 1 (never true) to 5 (very often). At the end, the participant selects the item that is most relevant to their sleep disturbance and can add any additional factors not mentioned in the</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>
| **6) Sleep Disturbance Questionnaire Extended Version**  
(Coyle & Watts, 1991)  
UK | An extended version of the SDQ was developed in order to better identify a wide range of key features of insomnia.  
The items in this extended version comprise 6-factors:  
1) aftereffects of poor sleep  
2) sleep attitudes  
3) mental activity  
4) sleep maintenance  
5) dissatisfaction with sleep  
6) sleep onset | Attitudes  
Arousal | Theoretical conceptualisation of insomnia  
Unknown  
Insomnia  
30 items  
(12 items from the original SDQ & 18 new items)  
The participant rates each item on a 5-point scale from 1 (never true) to 5 (very often). |
| **7) Dysfunctional Beliefs & Attitudes about Sleep Scale (DBAS)**  
(Morin et al., 1993)  
USA | The DBAS assesses various beliefs, attitudes, expectations, and attributions about sleep and insomnia.  
There are 5 conceptually derived themes:  
1) misattribution or amplification of insomnia consequences  
2) diminished perception of control & predictability of sleep | Beliefs  
Attitudes | The authors derived the items from theory and clinical practice.  
Insomnia  
28 & 30 items  
(The scale was initially developed with 28 items, and these are accounted for in the 5 themes. Two items were later added, and one of these items appears on the DBAS-16).  
The rating scale is a visual analogue scale |
3) unrealistic sleep expectations  
4) misconceptions about the causes of insomnia  
5) faulty beliefs about sleep-promoting practices  

| 8) Insomnia Impact Scale (IIS)  
(Hoelscher, Ware, & Bond, 1993) *  
USA |
|---|
| The IIS assesses the perceived impact of insomnia on daytime functioning. This includes physical, cognitive, emotional, social, and occupational effects.  
Perception |
| Unknown |
| Unknown |
| Insomnia |
| 40 items |
| The rating scale is numbered from 0 (strongly disagree) to 100 (strongly agree).  
Higher scores indicate a higher tendency for cognitions that may be exacerbating insomnia. |

| 9) Sleep Anticipatory Anxiety Questionnaire (SAAQ)  
(Bootzin, Shoham, & Kuo, 1994)  
USA |
|---|
| The SAAQ was developed to evaluate whether insomnia treatments effectively reduce pre-sleep arousal.  
The SAAQ has two factors:  
1) the overall degree of pre-sleep anxiety reported  
2) the extent to which an | Arousal |
| Unknown |
| Unknown |
| Insomnia |
| 10 items |
| (5 items each for cognitive and somatic arousal)  
The instruction reads “When I try to fall asleep at night…” The person then chooses one of four responses from 1 |
<table>
<thead>
<tr>
<th></th>
<th>individual reports cognitive versus somatic arousal</th>
</tr>
</thead>
<tbody>
<tr>
<td>10) Night-Time Thoughts Questionnaire (NTTQ) (Watts et al., 1994)</td>
<td>This questionnaire was developed to identify the thought content of people with insomnia when unable to sleep, in order to better understand if thoughts are related to sleep or unrelated to sleep. This questionnaire has 6 factors: 1) mental activity &amp; rehearsal 2) thoughts about sleep 3) family &amp; long-term concerns 4) positive concerns &amp; plans 5) somatic preoccupations 6) work &amp; recent concerns</td>
</tr>
<tr>
<td>Worry Arousal</td>
<td>Theoretical conceptualisation of insomnia</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>11) <strong>Perceived Control of Sleep (PCS)</strong> (Watts, East, &amp; Coyle, 1995)</td>
<td>The questionnaire assesses perceived control of both sleep and pre-sleep states. The following groups of questions comprise the measure: 1) 2 positively phrased questions representing control over sleep 2) 2 negatively phrased questions representing lack of control over sleep 3) 2 questions positive phrased concerned with maintaining sleep 4) 2 questions negatively phrased concerned with maintaining sleep 5) questions concerned with control over physical and mental states before sleep 6) questions concerned with expectations about controlling sleep</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>12) <strong>Expectations of Sleep</strong> (Watts et al., 1995)</td>
<td>This was a rating scale to learn how well participants expected to sleep the next night following a good, bad, and exceptionally bad night and series of nights.</td>
</tr>
</tbody>
</table>
This questionnaire measured the extent to which participants attributed certain reasons to when they are unable to sleep. This included:

1) physical circumstances
2) bad luck
3) events or stresses in life
4) being overtired
5) being naturally a poor sleeper
6) over-active mind
7) physically tense
8) being too alert

This questionnaire also measured the extent of emotions experienced when unable to sleep. These emotions were:

1) angry
2) exasperated
3) frustrated
4) anxious
5) resigned
6) helpless
7) philosophical
8) depressed

<table>
<thead>
<tr>
<th>Attributions &amp; Emotional Reactions</th>
<th>Theoretical conceptualisation of insomnia</th>
<th>Unknown</th>
<th>Insomnia</th>
</tr>
</thead>
</table>
| This questionnaire measured the extent to which participants attributed certain reasons to when they are unable to sleep. This included:  
1) physical circumstances  
2) bad luck  
3) events or stresses in life  
4) being overtired  
5) being naturally a poor sleeper  
6) over-active mind  
7) physically tense  
8) being too alert  
This questionnaire also measured the extent of emotions experienced when unable to sleep. These emotions were:  
1) angry  
2) exasperated  
3) frustrated  
4) anxious  
5) resigned  
6) helpless  
7) philosophical  
8) depressed | 16 items (8 items each for attributions and emotional reactions.)  
Participants rate on a 4-point scale from 1 (not at all) to 4 (to a great extent) depending on how applicable each question is for them. |
### Sleep Beliefs Questionnaire (SBQ) (Ware, Hood, Perlstrom, & Bond, 1996)

The SBQ was developed to measure people’s general beliefs of sleep rather than their own personal effects of disturbed sleep e.g. “People are more likely to catch colds and other illnesses if their sleep is disturbed.”

The questionnaire has 3-factors:
1. Catastrophizing
2. Sleepiness/fatigue
3. Sleep worry

Beliefs | Unknown | Unknown | Insomnia
--- | --- | --- | ---
40 statements | Participants rate how much they agree with each statement from 5 (strongly agree), 4 (agree), 3 (neutral), 2 (disagree) to 1 (strongly disagree).

A rating of 5 reflects the greatest impact of disturbed sleep.

### Self-Statement Test +60 (SST:60+)

The SST: 60+ is a closed-ended inventory measure of positive (“enjoyable things I did during the past few days”) and negative (“poor health of family members or friends”) thoughts experienced by older individuals during nocturnal awake times.

Arousal | Theoretical conceptualisation of insomnia | In a previous investigation, the authors identified 17 different discrete thought content areas from an open-ended thought listing exercise with older adults who have insomnia.
| | | Insomnia
--- | --- | ---
34 items (17 items each for positive and negative thoughts).

Participants indicate how often (when awake) they experience the 34 thought items using a 5-point scale from 0 (never or hardly ever to 4 (very often).

The sum of the positive and negative scores results in separate thought frequencies. A
<table>
<thead>
<tr>
<th>Study</th>
<th>Measure</th>
<th>Description</th>
<th>Factors</th>
<th>Scale</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBAS-10</td>
<td>The DBAS-10 is a refined version of the DBAS that includes the items that have the most significant change at post treatment following cognitive behaviour therapy for insomnia.</td>
<td>Beliefs, Attitudes</td>
<td>The authors refined the DBAS with the items that had most significant pre- to post-changes following CBT-I.</td>
<td>The rating scale is a visual analogue scale with the ends representing “strongly agree” and “strongly disagree.” Higher scores indicate a higher tendency for cognitions that may be exacerbating insomnia.</td>
<td>10 items</td>
</tr>
<tr>
<td>TCQ-I</td>
<td>The TCQ-I is designed to measure the use of six thought control strategies that may be helpful or unhelpful in the management of unwanted and intrusive thoughts: 1) suppression</td>
<td>Arousal, Worry</td>
<td>The TCQ-I is a revised version of the original Thought Control Questionnaire, designed to measure the use</td>
<td>Participants rate the frequency they engage in each item on a 4-point Likert scale from 1 (never), 2</td>
<td>43 items</td>
</tr>
</tbody>
</table>
| UK | 2) replacement  
3) punishment  
4) reappraisal  
5) social control  
6) worry | Theoretical conceptualisation of insomnia. | of five thought control strategies:  
1) distraction  
2) punishment  
3) reappraisal  
4) social control  
5) worry | (sometimes),  
3 (often) to 4 (almost always). |
|---|---|---|---|---|
| USA | **Sleep Disturbance Ascribed to Worry Scale (SAW)**  
(Kelly, 2002) | The SAW is a brief measure assessing sleep disturbance attributed to worry. It was developed in order to explore the relationship of habitual sleep length and worry. | Worry | Unknown | Insomnia | 5 items  
Participants indicate how often they experience each of the 5 items on an 11-point scale from 0 (never) to 10 (very often).  
Higher scores indicate more sleep disturbance attributed to worry. |
| | | | | | | |
| USA | **Utility of Pre-Sleep Worry Questionnaire (UPWQ)**  
(Harvey, 2003) | The UPWQ assesses for the function of worry during the pre-sleep period. It is suggested it could be used clinically to highlight the discrepancy between the function of these beliefs and actual sleep outcome. | Worry  
Arousal  
Beliefs | Theory and research relating to generalised anxiety disorder  
Cognitive model of insomnia | Insomnia | 60 items  
(36 positive belief statements representing functional beliefs; 24 negative belief statements) |
<table>
<thead>
<tr>
<th>UK</th>
<th>(Harvey, 2002a)</th>
<th>worry statements.</th>
<th>Participants chose “yes” or “no” for each statement, resulting in a total belief score both positive and negative beliefs. For the positive beliefs, an additional rating was made to account for if the goal of the belief was achieved.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>20) Glasgow Content of Thoughts Inventory (GCTI)</strong> (Harvey &amp; Espie, 2004)</td>
<td>The GCTI assesses the specific thought content of pre-sleep cognitive activity and the impact on sleep.</td>
<td>Arousal Research relating to increased cognitive activity in insomnia. Cognitive model of insomnia (Espie, 2002)</td>
<td>Service users with problems falling asleep completed audio recordings of their thoughts as they tried to fall asleep. Content analysis was conducted and items were generated from the themes. A draft scale was administered to people with insomnia and normal sleepers for further</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Insomnia</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Participants indicate how often each thought item kept them awake (over the past week). The rating scale was a 4-point scale from 1 (never), 2 (sometimes), 3 (often) to 4 (always). The items are summed to create a total score.</td>
</tr>
<tr>
<td>21) <strong>Sleep Related Behaviour Questionnaire (SRBQ)</strong> (Ree &amp; Harvey, 2004) UK</td>
<td>The SRBQ assesses the frequency of daytime and night-time sleep-related safety behaviours used by people with insomnia.</td>
<td>Safety behaviours</td>
<td>Cognitive model of insomnia (Harvey, 2002a)</td>
</tr>
<tr>
<td>22) Anxiety &amp; Preoccupation about Sleep Questionnaire (APSQ) (Tang &amp; Harvey, 2004) UK</td>
<td>The APSQ assesses sleep related worry specific to insomnia.</td>
<td>Worry</td>
<td>Cognitive model of insomnia (Harvey, 2002a)</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Participants rate how true each statement is based on the past 3 days, on a 10-point scale from 1 (not true) to 10 (very true). The items are summed to create a total score.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23) Sleep Associated Monitoring Index (SAMI) (Semler &amp; Harvey, 2004) UK</td>
<td>The SAMI assesses for sleep-related threats that contribute to insomnia. Principal components analysis identified 10 subscales: 1) daytime monitoring for body sensations 2) calculation of time (pre-sleep/waking) 3) waking monitoring for body</td>
<td>Threat-monitoring Arousal</td>
<td>Cognitive model of insomnia (Harvey, 2002a)</td>
</tr>
<tr>
<td></td>
<td>Participants choose how much they notice each item on a typical night or typical day in the past month. The rating scale is 1 (not at all), 2 (a little), 3 (somewhat), 4 (often) and 5 (all the time).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4) pre-sleep monitoring for body sensations consistent with falling asleep
5) daytime monitoring of functioning
6) pre-sleep monitoring for body sensations inconsistent with falling asleep
7) pre-sleep monitoring the clock
8) pre-sleep monitoring the environment

The second stage tested the items with university students. Additional items were incorporated based on feedback with this group. Psychometric analysis eliminated inappropriate and redundant items.

Higher scores represent a higher tendency to monitor sleep-related threats.

<table>
<thead>
<tr>
<th>24) <strong>Sleep Locus of Control (SLOC)</strong></th>
<th>Control Beliefs</th>
<th>Social learning theory</th>
<th>Insomnia</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Vincent, Sande, Read, &amp; Giannuzzi, 2004)</td>
<td>The SLOC is designed to measure sleep locus of control on a continuum from chance locus of control (e.g. belief that sleep is not within personal control) to internal locus of control (e.g. belief that sleep is within personal control).</td>
<td>The author developed the items based on clinical experience.</td>
<td>8 items</td>
</tr>
<tr>
<td>CDN</td>
<td></td>
<td></td>
<td>Participants rated each item on a scale from 1 (strongly disagree) to 6 (strongly agree). The items are summed (3 are reverse scored) to give a total score. Higher total scores indicate a more internal sleep locus of control.</td>
</tr>
</tbody>
</table>
| **25) Glasgow Sleep Effort Scale (GSES)**  
(Broomfield & Espie, 2005) | The GSES assesses an individual’s attempts to control their sleep that may maintain the sleep disturbance insomnia.  
The items represent the following components of sleep monitoring:  
1) sleep effort  
2) sleep control  
3) sleep avoidance  
4) bedtime worry  
5) performance failure  
6) anticipatory anxiety  
7) daytime worry |
| **Sleep Effort** | **Empirically untested model of sleep effort** | **The GSES was developed in order to improve upon the previously developed Sleep Anxiety Scale (SAS) (Fogle & Dyal, 1983). The authors conducted content analysis on relevant measures in order to develop the model of sleep effort and determine the components that make up the GSES. One item per component was written.** |
| **Worry** | **Insomnia** | **7 items** |
| **Beliefs** | | Participants choose how true the statement related to their sleep pattern in the past week. They selected either “very much”, “to some extent” or “not at all”. |

| **26) Sleep Beliefs Scale (SBS)**  
(Adan, Fabbri, Natale, & Prat, 2006) | The SBS measures a person’s belief about whether certain behaviours have a particular effect on their sleep.  
<p>| <strong>Sleep Hygiene</strong> | <strong>Theoretical conceptualisation of insomnia</strong> | <strong>The SBS is a modified version of the SHAPS Sleep Hygiene and knowledge section (Lacks &amp; Rotert, 1986).</strong> |
| <strong>Beliefs</strong> | <strong>Insomnia</strong> | <strong>20 items</strong> |
| | | Participants rate each item as having either a “positive”, “neutral”, or “negative” effect on their sleep quality |</p>
<table>
<thead>
<tr>
<th>ID</th>
<th>Scale</th>
<th>Description</th>
<th>Domain</th>
<th>Version</th>
<th>Factor Analysis</th>
<th>Item Reduction</th>
<th>Scoring</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>DBAS-16</td>
<td>The DBAS-16 version was developed in order to encourage more widespread use for clinical and research purposes. Confirmatory factor analysis identified 4-factors: 1) consequences of insomnia 2) worry about sleep 3) sleep expectations 4) medication</td>
<td>Beliefs/Attitudes</td>
<td>Theoretical conceptualisation of insomnia</td>
<td>Psychometric criteria, clinical relevance &amp; usefulness, and balancing representation of each conceptual domain were considered in order to refine the item list of the DBAS to 16 items.</td>
<td>Insomnia</td>
<td>16 items</td>
<td>The rating scale is a Likert-type scale from 0 (strongly disagree) to 10 (strongly agree). The total and subscale scores are based on the average of relevant scores. Higher scores indicate a higher tendency for cognitions that may be exacerbating insomnia.</td>
</tr>
<tr>
<td>28</td>
<td>Sleep Preoccupation Scale (SPS)</td>
<td>The SPS is a measure assessing sleep-related daytime preoccupations.</td>
<td>Arousal/Worry</td>
<td>Theoretical conceptualisation of insomnia (Espie, 2002)</td>
<td>In a previous study by Ellis, Hampson, and Cropley (2002),</td>
<td>Insomnia</td>
<td>22 items (14 items relating to Cognitive/Behavioural consequences and 8...</td>
<td></td>
</tr>
</tbody>
</table>
Behavioural & neurocognitive models of insomnia (Perlis, Giles, Mendelson, Bootzin, & Wyatt, 1997)

Cognitive model of insomnia (Harvey, 2002a)

normal and poor sleepers provided sleep-related daytime thoughts, feelings, and behaviours. These reports were analysed and resulted in six content analysis categories which items were generated for:
1) affective responses
2) cognitive consequences
3) physiological consequences
4) behaviour modifications
5) relationships with others
6) prospective ruminations

items relating to Affective Consequences.)

Participants rate how often they think about each of the items throughout the day on a 7-point Likert scale from 0 (never) to 6 (all the time).

Higher scores indicate higher levels of sleep preoccupation.
<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sleep Knowledge Questionnaire (SKQ)</strong> (Gallasch &amp; Gradisar, 2007) AUS</td>
<td>This SKQ assesses for knowledge about the effects on sleep of the following groups: 1) sleep hygiene behaviour e.g. “Going to bed hungry benefits sleep.” 2) behavioural treatments such as stimulus control or bedtime restriction e.g. “If you cannot fall asleep within 20 minutes, you should get out of bed and try again.”</td>
</tr>
<tr>
<td><strong>Sleep hygiene</strong> Sleep knowledge</td>
<td>The authors propose a “Sleep knowledge – behaviour – quality model” that requires further research.</td>
</tr>
<tr>
<td><strong>The SKQ is an extended version of the SHAPS Awareness (Sleep Hygiene Knowledge) section (Lacks &amp; Rotert, 1986) by including additional items that assess for knowledge on behavioural treatments.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Poor sleepers / insomnia</strong></td>
<td>Poor sleepers / insomnia</td>
</tr>
<tr>
<td><strong>25 items</strong></td>
<td>Participants selected either “true”, “false”, or “I don’t know” for each item.</td>
</tr>
<tr>
<td><strong>Higher scores indicate greater sleep knowledge.</strong></td>
<td></td>
</tr>
</tbody>
</table>

| **Metacognitions Questionnaire – Insomnia (MCQ-I)** (Waine, Broomfield, Banham, & Espie, 2009) UK | The MCQ-I assesses for metacognitive beliefs held by those with primary insomnia. The measure is comprised of experiences a person may have while lying in bed at night before falling asleep e.g. “Before I fall asleep, I should closely examine my thoughts.” |
| Beliefs Worry | Cognitive model of insomnia (Wicklow & Espie, 2000) Self-regulatory executive function model (Wells & Matthews, 1996) Authors propose more research to develop a specific |
| **The authors developed statements based on their expertise in the field of insomnia, reviewing the transcripts of interviews were conducted with both those who have insomnia and normal sleepers, and reviewing a range of metacognitive** |
| **Insomnia** | Insomnia |
| **60 items** | Participants rate how much they agree with each item on a 4-point Likert scale from 1 (do not agree) to 4 (agree very much). |
31) **Views on Sleep Scale**  
**VOSS** (Dolan, 2013; Dolan & Bruck, 2010)  

<table>
<thead>
<tr>
<th>AUS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The VOSS is designed to assess an individual’s beliefs, attitudes, expectations, and attributions about sleep and insomnia.</strong></td>
</tr>
<tr>
<td><strong>Beliefs</strong></td>
</tr>
<tr>
<td><strong>Cognitive model of insomnia (Harvey, 2002a)</strong></td>
</tr>
<tr>
<td><strong>The author developed statements by first adapting 11 items from the DBAS (Morin et al., 1993) and 5 items from the SBQ (Ware et al., 1996). An additional 9 items were developed based on key issues in the literature. All items were worded to be general for the wider community e.g. “I need 8 hours…” became “People need 8 hours…”</strong></td>
</tr>
</tbody>
</table>
| Insomnia / General population | **25 items**  
Participants rate how much they agree with each item on a Likert scale from 2 (strongly agree), 1 (agree), 0 (neither agree nor disagree), -1 (disagree) -2 (strongly disagree). |
| 32) Beliefs about Sleep Questionnaire (Digdon, 2010) | This measure assesses a person’s belief about how their sleep is affected or not by different factors. The measure is comprised of 3 sections:  
1) outcome expectations  
2) self-efficacy beliefs  
3) Self-identified sleep status  |
| Beliefs about Sleep Questionnaire (Digdon, 2010) | Beliefs about Sleep Questionnaire (Digdon, 2010)  
Social cognitive theory (Bandura, 2000)  
The items were informed by the Sleep Beliefs Scale (Adan et al., 2006), Sleep Hygiene Index (Mastin, Bryson, & Corwyn, 2006), criteria for inadequate sleep hygiene, and the authors observations of factors related to university student lifestyles.  |
| University students | University students  
45 items  
Participants rate section A as stating whether the item has either a “negative effect”, “no effect”, “positive effect”, or “I don’t know how this factor would affect my sleep.”  
Participants rate how easy it would be to implement a sleep-related recommendation using a 4-point scale from 1 (It would be very difficult) to 4 (It would be very easy). Higher scores indicate better self-efficacy.  |
| 33) Insomnia Daytime Worry Scale (IDWS) (Kallestad, Hansen, Langsrud, Hjemdal, & Stiles, 2010) | The IDWS measures the extent an individual has worried about insomnia-specific topics during the day during the last week.  |
| Insomnia Daytime Worry Scale (IDWS) (Kallestad, Hansen, Langsrud, Hjemdal, & Stiles, 2010) | Worry  
Self-regulatory executive function model (Wells & Matthews, 1996)  
The items were informed by open-ended clinical interviews held with individuals diagnosed with insomnia.  |
| Insomnia 11 items | Insomnia 11 items  
11 items  
Participants rate the frequency of having worried about each item in the past week on a 5-point Likert scale from 1 (Never) to 5 (Almost every day). Higher scores indicate more worry.  |
34) Daytime Functioning & Sleep Attribution Scale (DFSAS) (Kyle, 2010; Kyle, Morgan, & Espie, 2010) UK

The DFSAS is comprised of two parts:
1) assess the level of daytime interference of commonly reported symptoms e.g. “difficult concentrating and focusing on things”
2) assess the extent to which the individual attributes each daytime interference to poor sleep

Daytime functioning

Cognitive models of insomnia (Espie, 2002; Harvey, 2002a; Morin, 1993)

Authors developed items by taking into consideration three points:
1) items suitable for both poor and normal sleepers
2) items with good face validity
3) items specific to assessing perceived impact of insomnia related poor sleep on daytime functioning.

Insomnia

12 items

In part 1, participants rate how much each daytime interference has been a problem in the past two weeks, using a 4-point scale from 0 (no problem at all) to 4 (a very big problem).

In part 2, participants rate how much poor sleep was responsible for each daytime interference using a 4-point scale from 0 (not at all) to 4 (entirely).

35) DBAS for Children-10 (Blunden, Gregory, & Crawford, 2013)

The DBAS for Children-10 is an adapted version of the DBAS that is shorter and more user friendly for use with children.

Factor analysis identified 3-

Beliefs

Cognitive- behavioural models of insomnia

Cognitive model

In a separate study, the original DBAS measure was simplified in language, concepts were

Insomnia

Children 9 - 14 years of age.

10 items

The rating scale is a Likert-type scale numbered from 1 (strongly disagree) to 5.
<table>
<thead>
<tr>
<th>Country</th>
<th>Factors</th>
<th>Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK, USA, AUS</td>
<td>1) beliefs about immediate negative consequences 2) beliefs about long-term negative consequences 3) need to control insomnia</td>
<td>of insomnia (Harvey, 2002a)</td>
<td>defined, and inappropriate items were removed (Gregory, Cox, Crawford, Holland, &amp; Harvey, 2009). To further refine the measure, feedback groups with sleep experts reviewed the length, item content and response format.</td>
</tr>
<tr>
<td>CDN, USA</td>
<td>Potential to use it with older paediatric age-groups.</td>
<td>(strongly agree). Scores are summed to make a total score. Higher scores indicate higher dysfunctional beliefs.</td>
<td></td>
</tr>
</tbody>
</table>

36) **Daytime Insomnia Symptom Response Scale (DISRS)**
(Carney, Harris, Falco, & Edinger, 2013)

This DISRS measures the ruminative tendencies in those with insomnia. Factor analysis identified 3-domains:

1) rumination about cognitive and motivation problems
2) negative emotions
3) fatigue

Ruminati on Cognitive model of insomnia (Harvey, 2002a) | Items were derived using the Symptom-Focused Rumination Subscale (SYM) (Bagby, Rector, Bacchiochi, & McBride, 2004) as a guide. The first author then |

**Insomnia** 20 items
Participants rate how frequently they engage in each of the behaviours when feeling tired. The rating scale is a 4-point scale from 1 (almost never) to 4 (almost always).
derived an additional 12 items based on daytime symptoms of insomnia reported in the diagnostic criteria for insomnia and elsewhere. An expert in insomnia then reviewed the items and provided feedback and approval.

Higher scores indicate higher levels of rumination.

| 37) **Glasgow Sleep Impact Index (GSII)** (Kyle et al., 2013) | The GSII is an individualised measure of insomnia-related quality of life impairment. | Quality of life | The GSII is a modified version of the Patient Generated Index (Ruta et al., 1994). After an initial development, it was piloted with a small group of participants (Kyle, Espie, & Morgan, 2010). The authors Insomnia | Insomnia | The GSII is comprised of 4 parts:

1) Participants first list the 3 most important things affected by their poor sleep.
2) This generated list is then ranked in order based on what concerns the person the most.
3) The participant then rates how bothered they were by each item on |
conducted a further modification based on the pilot outcome.

the list, in the past two weeks.

4) Finally, the participant assigns a hypothetical monetary value of up to £60 (split however they wish) to each of the items in order to get rid of the problem.
### Sleep Practices & Attitudes Questionnaire (SPAQ)
(Grandner, Jackson, Gooneratne, & Patel, 2014)

The SPAQ was developed to assess for behaviours and beliefs and attitudes about sleep relevant to health behaviour theory that may be useful in identifying potential targets in intervention. The final version of the measure has 16 subscales that includes:
- 1) knowledge of sleep
- 2) importance of sleep
- 3) impact on sleep
- 4) impact of sleep
- 5) self-efficacy

### Sleep hygiene

- Health belief model (Rosenstock, 1966)
- The theory of reasoned action (Montano & Kasprzyk, 2008)
- The transtheoretical model of behaviour change (Prochaska, Redding, & Evers, 2008)
- 3-factor model of insomnia (Perlis, Shaw, Cano, & Espie, 2010)

### Beliefs

- Participants rate items on a Likert scale ranging from 0 (strongly disagree) to 6 (strongly agree).

### Attitudes

- Items were derived from the literature on Health Behaviour Theory and from sleep clinician input. A refinement of the items was conducted with a panel of sleep experts. Feedback on face validity was completed through focus groups, research participants, and a panel of community members.

### Self-Efficacy

- The SPAQ is meant to be descriptively interpreted.

### Worry

### Health belief model

<table>
<thead>
<tr>
<th>Sleep Practices &amp; Attitudes Questionnaire (SPAQ)</th>
<th>Sleep hygiene</th>
<th>Health belief model (Rosenstock, 1966)</th>
<th>Items were derived from the literature on Health Behaviour Theory and from sleep clinician input. A refinement of the items was conducted with a panel of sleep experts. Feedback on face validity was completed through focus groups, research participants, and a panel of community members.</th>
<th>Insomnia</th>
<th>151 items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>The theory of reasoned action (Montano &amp; Kasprzyk, 2008)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The transtheoretical model of behaviour change (Prochaska, Redding, &amp; Evers, 2008)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3-factor model of insomnia (Perlis, Shaw, Cano, &amp; Espie, 2010)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Beliefs</td>
<td>Cognitive model of insomnia (Harvey, 2002a)</td>
<td>Items were derived to reflect catastrophic thoughts relating to sleep using existing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Participants rate items on a Likert scale ranging from 0 (strongly disagree) to 6 (strongly agree).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hadjistavropoulos, & MacNab, 2016

2) magnification
3) helplessness

Ruminating catastrophizing scales as a guide. A panel of experts in sleep or catastrophizing then conducted consensus ratings for each item to determine its consistency with the catastrophizing construct and which component the item belonged to.

40) Self-Efficacy Measure for Sleep Hygiene
SESHI (Gipson, Haas, Alfred, & Chilton, 2016)*

The SESHI was designed to assess self-efficacy for sleep hygiene. It has three subscales:
1) time management
2) disruptive influences
3) sleep influences

Sleep hygiene
Self-efficacy
Social cognitive theory (Bandura, 2000)

Items were developed based on best sleep practices as recommended by the National Sleep Foundation. Additionally, three nurse researchers with expertise in self-efficacy scale development served as content experts. One University students / general population 24 items.

Higher scores indicate increased self-efficacy.
A researcher had a background in sleep hygiene practices while the other two experts had experience with young adults.

| 41) **Charlotte Attitudes Towards Sleep (CATS) scale** (Peach & Gaultney, 2017) | The CATS scale assesses for attitudes towards sleep among the university student population. The measure has two subscales: 1) benefits subscale 2) time commitment subscale | Sleep hygiene Beliefs Attitudes | Theoretical framework of attitudes (Eagly & Chaiken, 2007) | An initial list of items were generated and then reviewed by subject matter experts. The items were then piloted with two samples of university participants, resulting in the refined version before psychometric testing was conducted. | University students | 10 items Participants rate each item on a scale ranging from 1 (strongly disagree) to 7 (strongly agree). Higher scores indicate more favourable attitudes toward sleep. |
4. The development of a theoretically derived measure exploring extreme appraisals of sleep in Bipolar Disorder: A Delphi study with professionals

This study has been submitted to the Behavioural and Cognitive Psychotherapy journal. Revision recommendations have been received and amendments are being finalised before resubmission.
The development of a theoretically derived measure exploring extreme appraisals of sleep in Bipolar Disorder: A Delphi study with professionals

Lydia Pearson$^{1,2}$, Sophie Parker$^{1,2}$, & Warren Mansell$^1$

$^1$School of Health Sciences, Division of Psychology & Mental Health, University of Manchester, Manchester UK

$^2$Greater Manchester Mental Health NHS Foundation Trust

Correspondence concerning this article should be addressed to:

Lydia Pearson

Psychosis Research Unit, Rico House, Greater Manchester Mental Health NHS Foundation Trust, Trust Headquarters, Bury New Road, Prestwich, Manchester, M25 3BL

Tel: +44 (0)161 358 1395

Email address: Lydia.Pearson@gmmh.nhs.uk
4.1. Abstract

**Background:** Sleep and mood are known to be linked and this is particularly evident in people with a diagnosis of bipolar disorder. It has been proposed that psychological interventions improving sleep can be a pathway for improving mood. In order for appropriate psychological interventions to be developed, the common cognitive processes maintaining these disorders need to be investigated.

**Aim:** This study aimed to explore and identify expert consensus on positive and negative sleep appraisals in the context of low and high mood states, using the Integrative Cognitive Model as a theoretical guide.

**Method:** A Delphi approach was utilised to allow clinical and research professionals, with experience in the field of bipolar disorder, to be anonymously consulted about their views on sleep appraisals. These experts were invited to participate in up to 3 rounds of producing and rating statements that represented extreme sleep appraisals.

**Results:** A total of 38 statements were developed and rated, resulting in a final list of 19 statements that were rated as “Essential” or “Important” by >80% of the participants. These statements represent the full range of extreme sleep appraisals this study had set out to explore, confirming the importance of better understanding and identifying positive and negative sleep cognitions in the context of high and low mood.

**Conclusion:** The statements reviewed in this study will be used to inform the development of a sleep cognition measure that may be useful in cognitive therapy addressing sleep and mood difficulties experienced along the BD spectrum.

*Keywords: bipolar disorder; mood swings; insomnia; hypersomnia; circadian; cognitive appraisals; reduced need for sleep; cognitive therapy*
4.2. Introduction

Mood and sleep are recognised to have a bidirectional relationship (Alvaro, Roberts, & Harris, 2013; Kahn, Sheppes, & Sadeh, 2013), and this is particularly evident in the mental health difficulty bipolar disorder (BD) (Abreu & Braganca, 2015; Plante & Winkelman, 2008). BD is a mood disorder characterised by at least one episode of elevated or irritable mood and/or episodes of depressed mood. Changes to sleeping patterns are reported as a possible symptom during both depressed mood states and elevated mood states (Ritter et al., 2015; Rosa et al., 2013). During depression a person might experience difficulties with falling and staying asleep (insomnia), or the person might sleep more than usual (hypersomnia). During elevated or irritable mood a person might experience feeling rested after only 3 hours of sleep, referred to as reduced need for sleep (American Psychiatric Association, 2013).

These clinically significant changes in sleeping patterns are not only a symptom during low or elevated mood, but are also known to occur before a mood episode happens (Correll et al., 2007; Gruber et al., 2011) and between mood episodes (Rosa et al., 2013). It has also been shown to be a risk factor for BD (Ritter et al., 2015), as evidenced in research that has looked at familial risk groups (Duffy et al., 2010; Ng et al., 2015; Ritter et al., 2015), groups who score high on measures that indicate a tendency toward high mood (Ankers & Jones, 2009; Ng et al., 2015) and those who meet bipolar at-risk criteria (Castro et al., 2015).

Both sleep and mood related difficulties are known to have significant negative impacts on a person’s quality of life (Roth & Ancoli-Israel, 1999). The impact is also felt on society due to occupational and health related costs for the person (Alshuler et al., 2006; Boland et al., 2015; Murray & Lopez, 1997), such as taking extended time off from work (Das Gupta & Guest, 2002). For these reasons, it is important that research is done in order to understand and inform intervention options for a person. Due to the increasing recognition that sleep and mood are bidirectional, as discussed above, interventions should support both difficulties. Pharmacological approaches are a common intervention for supporting those with BD and sleep disturbances. However, it is important to consider psychological interventions as this would enable more treatment choice and is in line with current NICE guidelines (National Institute for Health and Care Excellence [NICE], 2014). Additionally, psychological interventions have a range of positive advantages over pharmacological approaches. Harvey, Kaplan, et al. (2015) explain the disadvantages of medication include adverse drug interactions with mood stabilising medication, the reduced risk of daytime
residual effects, and possible dependence on or abuse of the medication (Levin & Hennessy, 2004). It should be noted that psychological interventions are not always positive and this can include factors such as client expectations, therapist competence, and limited therapy options (Curran et al., 2019). In order to improve potential adverse effects of psychological intervention, robust research needs to be conducted and disseminated.

Due to the high comorbidity with mental health disorders (Benca et al., 1992), sleep disturbance has become increasingly recognised as a common transdiagnostic process (Harvey, 2008a; Harvey et al., 2016; Harvey et al., 2011). It is proposed that improving sleep can be a pathway for improving mood (Harvey et al., 2011). Research has primarily focused on the sleep disturbance insomnia, and has identified cognitive processes that maintain this disturbance. This is detailed in the Cognitive Model of Insomnia and includes negative cognitive beliefs a person endorses about difficulties with sleeping (Harvey, 2002a). Identifying these cognitive beliefs informs Cognitive Therapy (CT) intervention, which then targets these beliefs (Edinger & Wohlgemuth, 2001). CT has been shown to be a useful intervention for people with insomnia (Morin et al., 2007). Additionally, CT for insomnia has been shown to have positive outcomes on both mood and sleep for people with a diagnosis of depression (Manber et al., 2008) and BD (Harvey, Kaplan, et al., 2015). In comparison to insomnia, there is limited research into other sleep disturbances such as hypersomnia and reduced need for sleep. In addition, the cognitive processes proposed to maintain insomnia do not necessarily account for these other sleep disturbances.

There is a need for a cognitive model that accounts for sleep disturbance variability and that can guide CT intervention for people with fluctuating sleep duration disturbances. Without an available cognitive model in the sleep literature, the area of BD research is a useful guide since BD is a psychiatric disorder that accounts for mood and sleep fluctuations. Healy and Williams (1989) first proposed that circadian rhythm disruption, such as sleep disturbances caused by stressors, in conjunction with cognitive distortions play a significant role in BD vulnerability. Jones (2001) further explained this relationship by proposing a model guided by Power and Dalgleish (1997) & Jones (1979) that explains it is ones internal attribution of circadian change that facilitates and maintains BD symptoms. Building on these theoretical models, the Integrative Cognitive Model (ICM) (Mansell et al., 2007) explains that multiple, extreme positive and negative appraisals about mood play an important role in driving mood up into an elevated state and down into a negative state. For example, heightened mood could be appraised positively as a sign of great success or negatively such as an impending breakdown (Buysse et al., 2010). These appraisals contribute to the person engaging in either ascent (Mansell & Lam, 2003) or
descent behaviours in order to control their internal state, causing mood to fluctuate as
different appraisals enter the person’s awareness (Mansell, 2006). In a recent systematic
review, multiple lines of evidence have suggested that these extreme appraisals are
associated with mood difficulties across the BD spectrum in both clinical and non-clinical
groups (Kelly et al., 2017)

It is this conflict of multiple, extreme appraisals that could also play a role in the changes
in sleep disruption across the shifting mood states. For example, a person might be driven
to reduce sleep when in an activated state so they can catch up on productivity following a
period in which they were low in mood and perhaps sleeping much more. This could be in
conflict with additional appraisals about the importance of sleep on general health and
mood, thus driving sleep fluctuation up and down. In order to identify these cognitive
processes, a sleep cognition measure is required to assess for the appraisals. A recently
conducted scoping review aiming to identify the range of sleep cognition measures for
sleep duration disturbances highlighted that there is currently no available measure
developed specifically for use with hypersomnbia or reduced need for sleep (Pearson,
Mansell, Turner, & Parker, 2018). The review instead highlighted that sleep cognitions in
insomnia have been widely researched, with the most common measure assessing for
insomnia available for use in CT being the Dysfunctional Beliefs and Attitudes Scale
(DBAS).

Building on the previous research in the insomnia literature, the aim of this Delphi study
was to explore and identify expert consensus on the range of positive and negative
appraisals a person might endorse about their sleep in the context of the different sleep
disturbances experienced in BD, in line with the theoretical ICM. These appraisals can
then inform the development of a measure that will offer a unique and novel identification
of cognitions that may be maintaining a more complex range of sleep changes and
difficulties found across the BD spectrum. This potential measure has the opportunity for
providing a more comprehensive identification of sleep related cognitions that can better
inform and suit the needs of a person engaging in CT for sleep and mood difficulties. This
study complements parallel work streams in a research program for psychometrically
testing this measure, reviewing it with service users, and incorporating it in studies to test
the role of sleep within the ICM framework.

4.3. Method

4.3.1. Delphi Method
The Delphi method is an anonymous consensus method that sets out to determine how much experts agree on a particular topic or issue. As explained by Hasson et al. (2000) and Jones and Hunter (1995), this method follows a series of rounds in which the identified experts contribute independent suggestions and recommendations on the topic or issue. These suggestions and recommendations are then developed into relevant headings or statements, which the experts are then invited to rank their level of agreement with. Additional rounds are completed to ensure that consensus is reached by the entire participant group. For these additional rounds, information from the previous round is supplied, such as the rate of agreement among the group. This allows the individual participant an opportunity to change their ranking based on the information of how the group ranked the statement. For the purposes of this study, the authors followed the approach used by Law and Morrison (2014) and Morrison and Barratt (2010) in which Round 1 is a preliminary phase for a smaller group of experts who are invited to help refine the statements for consensus with a larger participant group in later rounds.

4.3.2. Participants

For the development and refinement of statements in Round 1, published academics and/or research and training professionals were recruited who had been identified in the literature as having made a significant contribution to the understanding of mood disorders and in some instances also in the field of sleep research and/or in the ICM. Each potential participant was sent an invitation e-mail (See Appendix 3) introducing the team conducting this study and a brief introduction about the study and what it involved. A secure online link for SelectSurvey was included in the e-mail for the participant to take part anonymously in the study. The online link included the participant information sheet (See Appendix 4) and statements for the participant to provide feedback on along with the opportunity for suggesting new statements.

For the remaining rounds in consensus rating, the panel of experts was widened to include more participants who had worked clinically with people who experienced mood and sleep difficulties. The inclusion criteria for these additional rounds were:

- Minimum training level of either qualified occupational therapist, qualified social worker, research assistant, grade 6 nurse, CBT therapist, trainee clinical psychologist, or junior doctor.
- At least 1 year’s experience working with people who experience significant low and elevated mood difficulties (e.g. bipolar disorder or bipolar at risk) AND who have reported sleep difficulties (e.g. initiating, maintaining, or not needing sleep).
For these rounds, the same experts invited for Round 1 were also invited to take part. Additionally, the invitation asked the participant to inform colleagues who might be suitable to take part based on the inclusion criteria. Participants were also invited who worked in mental health services across the northwest of England, where the authors of this study have close links with relevant services. Only the participants who took part in Round 2 were invited to take part in the final Round 3. All participants completed the study through the SelectSurvey platform anonymously. A separate SelectSurvey link was available for the participant to leave their e-mail address for being invited to the additional rounds. This meant the data provided by the participants was anonymous to the researcher. Participants were given 4 weeks to complete each round, and were sent reminder e-mails when 2 and 1 week(s) remained. It was made clear that at any time an invitee or participant wanted to withdraw from taking part they could request to be removed from the e-mail invitation list.

### 4.3.3. Procedure

When consulted, the university research ethics committee did not require ethical approval since this study only asked professionals non-sensitive questions deemed strictly within their professional competence. Additionally, personal identifiable data was not collected from the participants.

Before Round 1, an initial group of statements representing extreme positive and negative appraisals were developed by the research team based on the theory of the ICM. This was completed by reviewing the literature and commonly used self-report measures for sleep disruptive cognitions, including the Dysfunctional Beliefs and Attitudes about Sleep Scale (Morin et al., 1993). Additionally, one of the authors (L.P.) reviewed an online BD Forum ([www.psychforums.com](http://www.psychforums.com)) in September 2016 for themes about sleep from a service user perspective that were reported in the messages on the forum. This is a widely used psychology and mental health forum with over 100,000 members, and enables discussion about personal experiences on a wide range of mental health topics. In the BD forum, the keywords “sleep”, “insomnia”, and hypersomnia” were used in the search bar to locate relevant postings for review that dated back to 2005. The themes obtained included difficulties around falling asleep and impact on mood, sleep as an avoidance of emotions, lack of sleep allowing motivation and creativity, and the positive impact of sleep on mood and stability.

In line with the theory of the ICM, the authors wrote the statements as accounting for the following 4 domains: positive appraisals of sleeping less than usual, positive appraisals of
sleeping more than usual, negative appraisals of sleeping less than usual, and negative appraisals of sleeping more than usual. The research team agreed the statements should reflect extreme positive and negative appraisals of sleep, whilst also accounting for the change in sleep duration that is represented by the sleep disturbances that are characteristic of BD (e.g. reduced need for sleep or insomnia is sleeping less than usual, whilst hypersomnia is sleeping more than usual). The result was 31 statements that were developed by the research team as a starting point for Round 1 (See Appendix 5).

4.3.3.1. Round 1

The participants for Round 1 were instructed to review the developed statements and rate how essential the statement was for inclusion on the new self-report measure. This was completed using a 5 point scale (1 = essential, 2 = important, 3 = do not know/depends, 4 = unimportant, 5 = should not be included). The participants were also invited to provide feedback on each of the statements with reasons for their choice of rating and any additional comments such as word changes. Finally, there was an option at the end for the participant to provide additional comments, statements or other suggestions for the measure based on their clinical and research expertise.

The authors reviewed the consensus rating and feedback and suggestions from Round 1, and amended the statements accordingly. Statements that received a high consensus rating of being either essential or important with minimal feedback or comments were kept the same. Statements that had received a low consensus rating and had significant comments or suggestions were replaced with amended versions. Comments and suggestions for new statements that were not on the original list were discussed in the research team and written by the authors as new statements. This resulted in 13 statements remaining the same, 15 statements amended, 3 statements removed, and 10 new statements added.

4.3.3.2. Round 2

The revised list of 38 statements (See Appendix 6) was then put out for Round 2 with the wider group of participants for consensus rating only. Following the method employed by (Langlands, Jorm, Kelly, & Kitchener, 2008; Law & Morrison, 2014; Morrison & Barratt, 2010), the following cut-off points were used by the research team to determine items for inclusion, exclusion, and re-rating:

- Statements rated by 80% or more of the participants as essential or important will be included in the self-report measure.
• Statements rated by 70-79% of the participants as essential or important will be re-rated in a further round for a further consensus check.
• Any statements that did not meet at least 70% rating of essential or important will be excluded.

The participants were asked to read each statement and rate how relevant the statement was for being included in a sleep measure for use with those who have mood swings. The participants rated each statement using the same 5-point scale used in Round 1. This resulted in the inclusion of 16 items, 17 items discarded, and 5 items for re-rating.

4.3.3.3. Round 3

In Round 3, the participants from Round 2 who had left their contact details for taking part in additional rounds were invited to take part anonymously via an online link with SelectSurvey. Participants were asked to re-rate only those items that 70-79% of respondents had rated as essential or important during Round 2 (n=5). To help inform the participants’ decision for re-rating, the percentage from Round 2 was included with each of the statements. It was explained that any statements from this round that met 79% or less consensus for essential or important would be discarded. Of these 5 statements, 3 were retained and 2 discarded.

4.4. Results

4.4.1. Demographics

For Round 1, the research team invited 24 experts identified in the literature, 12 of whom responded to take part (50% response rate). However, there were 10 participants who completed the round in full and so only their responses were used for analysis. For Round 2, 25 participants took part and for Round 3, 18 of the 25 participants took part (72% response rate). Table 3 provides an overview of the participant characteristics for all 3 rounds. Participants reported their current professional role (noted in Table 3) but also shared what previous relevant career history they had with BD and this included having been a researcher, an assistant psychologist, or having worked in different clinical settings.

4.4.2. Ratings of Importance Results

A total of 19 statements were retained in the final statement list after being rated as important or essential by > 80% of participants. Figure 1 summarises the number of items included, re-rated, and excluded at each round of the study.
<table>
<thead>
<tr>
<th></th>
<th>Round 1 (N = 10)</th>
<th>Round 2 (N = 25)</th>
<th>Round 3 (N = 18)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>6 (60%)</td>
<td>9 (35%)</td>
<td>9 (50%)</td>
</tr>
<tr>
<td>Female</td>
<td>4 (40%)</td>
<td>16 (64%)</td>
<td>9 (50%)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Age</td>
<td>41</td>
<td>35</td>
<td>34</td>
</tr>
<tr>
<td><strong>Current Profession</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultant Clinical Psychologist</td>
<td>2 (20%)</td>
<td>1 (4%)</td>
<td>1 (6%)</td>
</tr>
<tr>
<td>Clinical Psychologist</td>
<td>5 (50%)</td>
<td>11 (44%)</td>
<td>10 (56%)</td>
</tr>
<tr>
<td>Trainee Clinical Psychologist</td>
<td>0</td>
<td>1 (4%)</td>
<td>1 (6%)</td>
</tr>
<tr>
<td>Psychological Therapist</td>
<td>1 (10%)</td>
<td>2 (8%)</td>
<td>1 (6%)</td>
</tr>
<tr>
<td>Assistant Psychologist</td>
<td>0</td>
<td>2 (8%)</td>
<td>1 (6%)</td>
</tr>
<tr>
<td>Research Assistant</td>
<td>0</td>
<td>3 (12%)</td>
<td>3 (17%)</td>
</tr>
<tr>
<td>Lecturer / Research</td>
<td>1 (10%)</td>
<td>1 (4%)</td>
<td>1 (6%)</td>
</tr>
<tr>
<td>Professor</td>
<td>1 (10%)</td>
<td>2 (8%)</td>
<td>0</td>
</tr>
<tr>
<td>Assistant Practitioner</td>
<td>0</td>
<td>1 (4%)</td>
<td>0</td>
</tr>
<tr>
<td>Mental Health Nurse</td>
<td>0</td>
<td>1 (4%)</td>
<td>0</td>
</tr>
</tbody>
</table>
The final 19 statements are shown below in Table 4. The two statements that did not meet at least 70% for a further re-rating both reached only 67% consensus for essential or important by the participant group. The three statements that were included each reached above 80% consensus. For this reason, a further round of re-rating was not required. Also depicted in Table 4 are the statements included by each round, the percentage of agreement, and the domain the statement assesses for: positive appraisals of sleeping more than usual (n = 3), negative appraisals of sleeping more than usual (n = 3), positive appraisals of sleeping less than usual (n = 7), and negative appraisals of sleeping less than usual (n = 6).
Table 4. Study 2, High consensus items

<table>
<thead>
<tr>
<th>Item</th>
<th>Stage</th>
<th>Included</th>
<th>Percentage Agreement</th>
<th>Appraisal Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>The only way I can stop myself thinking is to sleep more than normal.</td>
<td>2</td>
<td>80%</td>
<td>+ / ↑</td>
<td></td>
</tr>
<tr>
<td>I sleep more to escape from the real world.</td>
<td>2</td>
<td>100%</td>
<td>+ / ↑</td>
<td></td>
</tr>
<tr>
<td>I have to sleep more to keep my mood stable.</td>
<td>2</td>
<td>80%</td>
<td>+ / ↑</td>
<td></td>
</tr>
<tr>
<td>Sleep prevents me from completing my many projects.</td>
<td>3</td>
<td>83%</td>
<td>- / ↑</td>
<td></td>
</tr>
<tr>
<td>When I sleep more than normal I feel so useless</td>
<td>2</td>
<td>84%</td>
<td>- / ↑</td>
<td></td>
</tr>
<tr>
<td>Sleeping too much is a sign that I am becoming depressed.</td>
<td>2</td>
<td>96%</td>
<td>- / ↑</td>
<td></td>
</tr>
<tr>
<td>If I only need a few hours of sleep, it is a sign that I'm on top of things.</td>
<td>3</td>
<td>83%</td>
<td>+ / ↓</td>
<td></td>
</tr>
<tr>
<td>I stay up very late or all night to bring on my elevated mood.</td>
<td>2</td>
<td>80%</td>
<td>+ / ↓</td>
<td></td>
</tr>
<tr>
<td>It is necessary for me to stay up very late or all night to get all of my work done.</td>
<td>2</td>
<td>92%</td>
<td>+ / ↓</td>
<td></td>
</tr>
<tr>
<td>I stay up very late or all night because of all my good ideas.</td>
<td>2</td>
<td>80%</td>
<td>+ / ↓</td>
<td></td>
</tr>
<tr>
<td>I stay up very late or all night because this is when I feel most creative.</td>
<td>2</td>
<td>88%</td>
<td>+ / ↓</td>
<td></td>
</tr>
<tr>
<td>I stay up very late or all night when I have elevated mood, because this is when I feel my best.</td>
<td>3</td>
<td>89%</td>
<td>+ / ↓</td>
<td></td>
</tr>
<tr>
<td>The less I sleep, the more likely it is I get everything done.</td>
<td>2</td>
<td>88%</td>
<td>+ / ↓</td>
<td></td>
</tr>
<tr>
<td>If I do not get enough sleep each night, I become extremely anxious.</td>
<td>2</td>
<td>88%</td>
<td>- / ↓</td>
<td></td>
</tr>
<tr>
<td>If I do not get enough sleep each night, I won't be able to function at all the next day.</td>
<td>2</td>
<td>96%</td>
<td>- / ↓</td>
<td></td>
</tr>
<tr>
<td>If I do not get enough sleep each night I will not be able to get done what needs to</td>
<td>2</td>
<td>84%</td>
<td>- / ↓</td>
<td></td>
</tr>
</tbody>
</table>
There were 6 items that reached extremely high consensus in Round 2 (> 90%). These statements have been highlighted in grey in Table 4 and are from the following domains: positive appraisals of sleeping more than usual (n = 1), negative appraisals of sleeping more than usual (n = 1), positive appraisals of sleeping less than usual (n = 1), and negative appraisals of sleeping less than usual (n = 3).

### 4.5. Discussion

The aim of this Delphi study was to explore and identify expert consensus on positive and negative sleep appraisals using the ICM as the theoretical framework for development of items. The results suggest that professionals working in the field of BD recognise that those who have sleep and mood difficulties endorse a range of extreme sleep appraisals. A total of 38 statements were developed and rated, resulting in high consensus for half of the statements. These final 19 statements all represent the range of extreme positive and negative appraisals of sleep that are in line with the theory of the ICM the authors had set out to investigate. This range covers four domains: positive appraisals of sleeping less than usual, positive appraisals of sleeping more than usual, negative appraisals of sleeping less than usual, and negative appraisals of sleeping more than usual.

With the focus in the literature and past research on cognitions about sleep having been focused on negative beliefs regarding insomnia (e.g. CT for insomnia), it is of particular interest that the domain that reached the most number (n = 7) of high consensus for statements was the domain assessing for positive appraisals of sleeping less than usual. This domain represents sleep appraisals in the context of reduced need for sleep. As highlighted by the recent systematic review conducted (Pearson et al., 2018), there have not been measures developed that assess for this domain. However, this Delphi study has shown that experts and clinicians in the field of BD recognise this to be at least as
important compared to the more widely recognised and researched negative appraisals of sleeping less than usual (e.g. insomnia).

4.5.1. Clinical Implications

With sleep disturbance proposed as mechanistically transdiagnostic across the mental health difficulties (Harvey et al., 2011), it is increasingly recognised that treatment for sleep may be a pathway for improving other symptoms associated with the mental health difficulties (Harvey, 2009; Harvey et al., 2016; Harvey, Soehner, et al., 2015). Clinicians could become trained in a broad sleep intervention that could be applied to a range of mental health difficulties to help reduce a number of symptoms the person is experiencing. However, sleep disturbance across mental health difficulties is wide ranging. For this reason, it is argued that disorder-specific sleep modules be available within a transdiagnostic sleep intervention (Harvey, 2009). In order for these disorder-specific interventions to be developed, research must be done to best understand the cognitive processes that maintain the range of sleep disturbances.

The extreme sleep appraisals identified in this Delphi study can inform the development of a new measure that will offer a unique and novel identification of sleep cognitions that may be maintaining a more complex range of sleep changes and difficulties found across the BD spectrum. This potential measure has the opportunity for providing a more comprehensive assessment that can better inform and suit the needs of a person engaging in CT for sleep and mood difficulties.

4.5.2. Strengths and Limitations

This study had several strengths. First, the strength of a Delphi consensus method enables decision making to be shared amongst a group of equally level participants anonymously (Jones & Hunter, 1995). This prevents the risk of anyone dominating the consensus process, since everyone independently provides their response in the rounds (Keeney, Hasson, & McKenna, 2006; Rowe & Wright, 2001). Specific to this study, the recommendations and the consensus of the experts went beyond what has been reported in the literature regarding the additional domains of positive and negative sleep appraisals in the context of sleeping more or less than usual. Second, the response rate for Round 3 was 72%, which meets the recommended rate of at least 70% (Hasson et al., 2000). Third, service user input was included to help identify the range of positive and negative sleep appraisals people with BD might endorse. This was completed through reviewing postings on an online forum. Forums have been reported to provide a comfortable space for people
to anonymously discuss personal issues (Campbell et al., 2001) whilst also enabling participants to join in the discussions at their convenience (Hsiung, 2000). It could be argued that this allows a person to give an honest explanation of their difficulties at times when they are experiencing symptoms. Fourth, the appraisals identified and explored in this study were derived using the ICM as the theoretical framework. These appraisals will inform the development of a sleep cognition measure which will be assessed on content validity. Content validity is the degree to which the measure adequately reflects the construct in question. Assessment of construct validity for a measure includes rating if the measure’s origin of construct was defined by a theoretical model (Terwee et al., 2018), which this study has clearly stated.

There are several limitations to this study. First, it is increasingly recognised that service users should be involved in questionnaire development in order to truly capture their perspectives and to ensure the questionnaire is understandable (Terwee et al., 2018). Although the research team utilised an online BD forum for sleep themes, it is unknown what number of users had a clinical history of elevated or depressed mood across the BD spectrum. To ensure the measure is understandable and relevant for those who experience sleep and mood fluctuations common across the BD spectrum a service user feedback review will be conducted. This will be an opportunity for service users to rate the measure for content and face validity and compare it to a commonly used, validated measure of insomnia specific cognitions. A second limitation was the response rate was less than 70% for Round 1 (when 24 people had been invited) and thus did not meet the recommended 70% rate (Hasson et al., 2000). Second, there were relatively low numbers of participants taking part in each round. One reason for this may be because invitations to take part in the study were mainly conducted by e-mail, whereas previous research has found that conducting the first round in person has led to a higher response rate in subsequent rounds (McKenna, 1994). Additionally, because there are low numbers of experts taking part in the study it may be that the range of appraisals has not been fully identified. However, there was consensus for all four domains this study set out to explore which does give validity to the range having been represented.

4.5.3. Conclusion

To the authors’ knowledge, this is the first study to have sought the expert opinion and consensus on extreme positive and negative sleep appraisals in the context of low and high mood states. A high level of consensus was reached for a range of sleep appraisals that cover each of the four domains this study set out to explore and identify. These findings
confirm shared agreement amongst professionals in the field of BD that extreme positive and negative sleep appraisals are important to understand and identify across the range of mood states. The statements reviewed in this study will be used to inform the development of a sleep cognition measure that will be tested for use with CT addressing fluctuating sleep disturbances experienced across the BD spectrum.

4.6. Acknowledgments

The authors would like to thank all the participants for their time and contributions to this research. Also, a special thanks to Dr. Heather Law who recommended the Delphi methodology for the purposes of this study’s aim.
5. Initial psychometric validation of the Positive and Negative Sleep Appraisal Measure (PANSAM) along the mood and sleep continuum

This study has been submitted to the Behavioural Sleep Medicine Journal and recommended revisions have been received. The author (LP) is planning on working on the revisions and resubmitting to this journal.
Initial psychometric validation of the Positive and Negative Sleep Appraisal Measure (PANSAM) along the mood and sleep continuum

Lydia Pearson\textsuperscript{1,2}, Warren Mansell\textsuperscript{1}, & Sophie Parker\textsuperscript{1,2}

\textsuperscript{1}School of Health Sciences, University of Manchester, Manchester, UK

\textsuperscript{2}Greater Manchester Mental Health NHS Foundation Trust, Manchester, UK

Correspondence concerning this article should be addressed to:

Lydia Pearson, Psychosis Research Unit, Rico House, Greater Manchester Mental Health NHS Foundation Trust, Trust Headquarters, Bury New Road, Prestwich, Manchester, M25 3BL, Tel: +44 (0)161 358 1395. Email address: Lydia.Pearson@gmmh.nhs.uk

Lydia Pearson: ORCID ID - 0000-0003-2890-192X
5.1. Abstract

**Objective & Background:** Sleep disturbances have a bidirectional relationship with mood and psychological interventions addressing sleep could improve mood. The Positive and Negative Sleep Appraisals Measure (PANSAM) is a theoretically derived measure intended to identify cognitive appraisals for the sleep disturbances present across the high and low mood spectrum: insomnia, hypersomnia, and reduced need for sleep. The aim of this study is to conduct initial psychometric validation of this measure.

**Participants:** Participants (n = 288) were recruited from the general population via convenience sampling to take part in this cross-sectional online study.

**Methods:** Participants completed the PANSAM as well as measures of mood, sleep quality, and mood and sleep cognitions including the commonly used Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS). Exploratory factor analysis (EFA), construct validity, and a hierarchical multiple regression analysis were conducted.

**Results:** EFA revealed a 22-item four factor structure matching the intended theoretical statements representing positive and negative appraisals of sleeping more and less than usual. Construct validity was supported. The regression identified one DBAS subscale (control and predictability) and one PANSAM subscale (positive appraisals of sleeping more than usual) as having predictive usefulness with poor sleep quality, as measured by the Pittsburgh Sleep Quality Index (PSQI).

**Conclusions:** The findings provide initial validation of the PANSAM. With further validation measuring sleep variability and using clinical samples, the PANSAM could potentially inform sleep interventions and measure therapeutic outcomes.

*Keywords: Sleep; mood; appraisal; cognition; psychometric*
5.2. Introduction

Sleep disturbances are increasingly recognised as preceding (Breslau et al., 1996; Perlis et al., 2006) and co-occurring (Benca et al., 1992; Harvey, 2001b; Roth et al., 2006) with mental health disorders. This is particularly evident in bipolar disorder (BD), a mental health difficulty characterised by alternating periods of depressed and elevated mood instability (American Psychiatric Association, 2013). Sleep disturbances such as insomnia (difficulties initiating & maintaining sleep), hypersomnia (excessively lengthy sleep), and reduced need for sleep are present across the shifting mood states with BD.

Evidence that mood and sleep are bidirectionally linked is growing, and research continuously points to the importance of sleep duration in this link. Reduced sleep duration has been shown to adversely affect mood in healthy, non-patient participants (Dinges et al., 1997; Pilcher & Huffcutt, 1996), with rapid sleep loss resulting in greater mood impairment (Drake et al., 2001). For patients with BD, reduced sleep duration has been associated with elevated mood (e.g. mania / hypomania) the following day (Barbini et al., 1996; Bauer et al., 2006; Leibenluft et al., 1996) and predicted depressive symptoms over a six month period (Perlman, Johnson, & Mellman, 2006). Increase in sleep or bed rest (e.g. hypersomnia) is associated with a pattern of depression the next day (Bauer et al., 2006) and future depressive symptoms (Kaplan et al., 2011).

It is recommended that psychological interventions be offered for management of BD (National Institute for Health and Care Excellence [NICE], 2014). However, more research needs to be conducted to learn the benefits of a psychological sleep intervention for mood disorders. Cognitive behavior therapy for insomnia (CBT-I) has shown promising outcomes for those with depression (Manber et al., 2008) and BD (Harvey, Soehner, et al., 2015). A component of CBT-I is targeting cognitions about sleep (Edinger et al., 2001) that are known to contribute to the maintenance of the sleep disturbance (Harvey, 2002a). These cognitions are most often identified with the use of the Dysfunctional Beliefs and Attitudes about Sleep (DBAS) Scale (Morin, 1993; Morin et al., 1993). However, insomnia is only one sleep disturbance present across the mental health disorders. As discussed above, those with BD also experience hypersomnia and reduced need for sleep which the maintaining cognitive features are poorly understood compared to the extensively researched area of insomnia. Earlier psychological models have proposed that the appraisals of the consequences of sleep disruption may contribute to the symptoms of BD (Healy & Williams, 1989; Jones, 2001).
In order to address this gap in the research a theoretically derived measure aimed at identifying the possible cognitive appraisals for insomnia, hypersomnia, and reduced need for sleep was developed. The Positive and Negative Sleep Appraisals Measure (PANSAM) is based on the transdiagnostic integrative cognitive model (ICM) developed in the field of BD (Mansell et al., 2007). The ICM proposes that conflicting, multiple and extreme positive and negative appraisals about mood contribute to a person engaging in ascent behaviours (driving mood up) or descent behaviours (driving mood down). This conflict is proposed to result in the clinical symptomology of shifting elevated and depressed mood states characteristic to BD. The Hypomanic Attitudes and Positive Predictions Inventory (HAPPI) is a measure that was developed in line with the ICM to assess these appraisals of mood and their effect on mood fluctuations (Mansell, 2006). In a recent review that included research conducted with the use of the HAPPI in both clinical and non-clinical samples, there is evidence that these extreme appraisals predict the mood swings and activation states that are indicative of bipolar symptoms (Kelly et al., 2017). In particular, it is the interaction of both positive and negative appraisals that differentiate those with BD from unipolar depression and healthy control participants (Kelly et al., 2011). Based on this, we expect the PANSAM will be a tool able to measure the interaction of positive and negative sleep appraisals that will predict the fluctuations in sleep duration experienced along the mood continuum. This can support psychological interventions for people experiencing fluctuations in sleep and mood, in which the identification of these conflicting appraisals can be identified, targeted, and measured.

This current study is part of a larger research program developing the PANSAM and further testing it with the use of a sleep diary and also patient groups. This cross-sectional, self-report study involves initial psychometric validation of the PANSAM and has several aims. The first is to explore the factor structure of the PANSAM guided by a similar analysis for the HAPPI (Dodd, Mansell, et al., 2011b). The second is to review the construct validity of the PANSAM with validated measures representing BD personality, mood, sleep, and cognitions relevant to both mood and sleep. Since the PANSAM has been developed to assess for a range of sleep duration appraisals across the shifting mood states, it is expected to be positively associated with high and low mood tendencies, poor sleep quality, and cognitions that maintain both sleep disruption and shifts in mood. Finally, a hierarchical multiple regression will be conducted to explore the PANSAM’s predictive usefulness with a validated sleep quality measure over the commonly used DBAS measure that is intended for use with insomnia.
5.3. Methods

5.3.1. Participants

Ethical approval for this study was obtained by the university (ref: 16314) with Research Ethics Committee 2. The sample consisted of 288 participants from the general population, recruited via convenience sampling to take part in this online study. The study was advertised at the university (See Appendix 9), on research websites (e.g. Citizen Scientist), and through social media (e.g. twitter). Individuals who did not complete the PANSAM in full were excluded for the purposes of the exploratory factor analysis (EFA), leaving n= 271 (94.1% of original dataset). The mean age was 27 (SD = 10.4) and 230 were female. Individuals who did not complete the remaining measures in full were excluded for the purposes of the remaining analyses, leaving n= 248 (86.1% of original dataset). The mean age for this group remained 27 (SD = 10.6) and 208 were female. A missing values analysis conducted for age and gender highlighted the difference for females (5.4% missing in the EFA sample vs 14.4% missing in the regression sample). This was further checked with a Little’s Missing Completely at Random (MCAR) test (Little, 1988) that confirmed the data was in fact MCAR (Chi-square = 7.841, DF = 5, Sig = .165).

5.3.2. Measures

5.3.2.1. Positive and Negative Sleep Appraisal Measure (PANSAM)

The (PANSAM) was developed to assess for extreme positive and negative sleep appraisals a person may endorse in regards to sleeping more or less than usual. A Delphi method study was conducted with professionals in the clinical and research field of BD in order to identify and achieve consensus on relevant appraisal statements (Pearson, Parker, & Mansell, 2019a). This study informed the development of the PANSAM statements written with theoretically derived subscales: Positive Appraisals of Sleeping More Than Usual, Negative Appraisals of Sleeping More Than Usual, Positive Appraisals of Sleeping Less Than Usual, and Negative Appraisals of Sleeping Less Than Usual. Participants rated 33-statements (e.g. “The less I sleep, the more likely it is I get everything done”) on a visual analogue scale from 0 (I don’t believe this at all) to 100 (I believe this completely).

5.3.2.2. Internal States Scale (ISS) (Bauer et al., 1991)

The ISS is a 16-item self-report measure designed to assess recent (24 hour) manic and depressive symptoms. The ISS has four empirically derived subscales with acceptable scale reliability (Cronbach’s α): Activation (α = .92), Well-being (α = .84), Perceived
Conflict (α = .87), and Depression Index (α = .81). These have been shown to discriminate mood states in BD (Bauer et al., 1991; Bauer et al., 2000; Cooke, Kruger, & Shugar, 1996). Participants completed questions 1-15 using a visual analogue scale from 0 (not at all / rarely) to 100 (very much so / much of the time). Question 16 asked the participant to rate how they feel, using a visual analogue scale from -50 (depressed / down) to 0 (normal) to +50 (manic / high).

5.3.2.3. Hypomanic Personality Scale (HYP) (Eckblad & Chapman, 1986)

The HYP is a 48-true/false-item, non-clinical measure that assesses for personality style associated with hypomanic episodes. The HYP has acceptable scale reliability (Cronbach’s α = .87) and good test-retest reliability after 15 weeks (r = .81).

5.3.2.4. Patient Health Questionnaire – 9 (PHQ-9) (Kroenke, Spitzer, & Williams, 2001)

The PHQ-9 is a 9-item self-report measure of depression severity with acceptable scale reliability (Cronbach’s α 0.89 and α 0.86 in two separate samples) and test-retest reliability (correlation = 0.84; mean scores 5.08 vs. 5.03). Participants were asked how often they have been bothered by the 9-items over the past 2 weeks, with four options ranging from 0 (not at all) to 3 (nearly every day). Total scores indicate minimal, mild, moderate, moderately severe, and severe levels of depression severity.

5.3.2.5. Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989)

Pittsburgh Sleep Quality Index (PSQI) is a 19-item self-report measure assessing sleep quality during the previous month. It is comprised of seven components measuring subjective sleep quality, latency, duration, efficiency, disturbances, use of sleeping medications, and daytime functioning. These components are then totalled for a global PSQI score that has a range of 0-21, with higher scores indicating worse sleep quality. Scale reliability is acceptable (Cronbach’s α 0.83).

5.3.2.6. Hypomanic Attitudes & Positive Predictions Inventory (HAPPI) (Mansell, 2006)

The HAPPI is a 61-item self-report measure assessing for the multiple, extreme, and personalised appraisals about high and low mood. Participants rate the statements using a visual analogue scale from 0 (I don’t believe this at all) to 100 (I believe this completely). The HAPPI has a 6-factor structure with acceptable scale reliability: Social Self-Criticism (Cronbach’s α .90), Increasing Activation to Avoid Failure (Cronbach’s α 0.83), Success
Activation and Triumph Over Fear (Cronbach’s α 0.86), Loss of Control (Cronbach’s α 0.87), Grandiose Appraisals of Ideation (Cronbach’s α 0.83) and Regaining Autonomy (Cronbach’s α 0.80) (Dodd, Mansell, et al., 2011b).

5.3.2.7. Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS) (Morin et al., 1993)

The DBAS is a 28-item scale that assesses for a range of beliefs, attitudes, expectations, and attributions about sleep and insomnia. Five conceptually derived themes comprise the scale: Consequences of Insomnia, Control and Predictability of Sleep, Sleep Requirement Expectations, Causal Attributions of Insomnia, and Sleep-Promoting Practices. Participants rated the statements (e.g. “I need 8 hours of sleep to feel refreshed and function well during the day”) on a visual analogue scale from 0 (Strongly disagree) to 100 (Strongly agree). Item 23 is reverse scored, and higher scores indicate a dysfunctional belief. The DBAS scale has acceptable scale reliability with both good (Cronbach’s α = 0.80) and poor (Cronbach’s α = 0.81) adult sleepers.

5.3.3. Procedure

Participants accessed the study via a secure online link with Select Survey, where they first read the participant information sheet. Informed consent was then obtained before the participant completed demographic information and the measures. Upon finishing the study, all participants were able to read a debrief document that signposted towards support services should they have any concerns about their mood or sleep.

5.3.4. Statistical Analysis

All data was analysed using SPSS for Windows (Version 22). In line with the method utilised for reviewing the factor structure of the HAPPI (Dodd, Mansell, et al., 2011b) maximum likelihood (ML) extraction and varimax rotation were applied for the EFA carried out on the PANSAM. ML is a “true” factor reduction analysis (Costello & Osborne, 2005) appropriate for use with normally distributed data, as indicated by skewness < 2 and kurtosis < 7 (Curran, West, & Finch, 1996; Ryu, 2011). One item on the PANSAM (17) exceeded this (skew = 3.02; kurtosis = 9.18) and was thus removed. Upon review of the correlation matrix, two items (27 & 31) only correlated with one another and were also removed. The Kaiser-Meyer-Olkin statistic (= 0.90) and Bartlett’s test of sphericity (X2(435) = 3505.28, p < 0.001) both indicated the sample was appropriate and suitable and goodness-of-fit was significant X2 (270) = 397.92, p < 0.001.
An initial EFA analysis was conducted in order to identify the number of factors to retain. Those with an eigenvalue above 1.0 were initially reviewed which resulted in 6-factors and in combination explained 48.36% of the variance. Keeping factors with an eigenvalue above 1.0 are subject to Kaiser’s criterion (Kaiser, 2016) and this is most accurate when the average of communalities is above 0.6 (Field, 2009). However, for this data the average of communalities was 0.5. For this reason, the scree plot was examined to determine the number of factors to retain since the number of participants is more than 200 (Stevens, 2002). The point of inflexion was determined to be at the 5th factor. It was agreed by the research team that due to the exploratory nature of this measure, both 4- and 5-factors retained would be compared since there are arguments for different approaches when using a scree plot interpretation. Cattell (1966) argues for the point of inflexion to be included, whereas many researchers only include the factors to the left of the point of inflexion (Field, 2009). A comparison by the research team would be conducted to determine the most desirable rotated factors as advised by Yong and Pearce (2013).

For the construct validity analysis the skew, kurtosis, q-plot, and histogram for each measure and subscale subject to the correlation analysis were reviewed for normal distribution. To ensure Type I or Type II error rates were not inflated with using only a bi-variate Pearson (r) correlation analysis (Blair & Lawson, 1982), the more conservative Spearman’s rho (rs) correlations were also conducted for comparison (Bishara & Hittner, 2015).

For the third aim of this study to initially explore the PANSAM’s predictive usefulness for sleep quality over the commonly used DBAS measure a three-stage, forced-entry hierarchical multiple regression was conducted with PSQI global sleep score as the dependent variable. Age and gender was entered at the first stage of the regression. HYP was entered at the second stage of the regression to control for predisposition to BD traits. Also entered in the second stage were the DBAS subscales since this is the validated measure in the literature most often used to identify sleep beliefs that may be maintaining the sleep disturbance insomnia. The PANSAM factors were then entered in the third stage of the regression. The relevant assumptions for this statistical analysis were reviewed. First, there was no multicollinearity as determined by reviewing the Coefficients output where VIF did not exceed 10 (range 1.02 to 2.66) and Tolerance was above .10 (range from .38 to .93). The values of the residuals were determined to be independent (Durbin-Watson 1.97). Review of the P-Plot confirmed the residuals were normally distributed and the scatterplot confirmed homoscedasticity.
5.4. Results

5.4.1. Exploratory factor analysis

Following the initial analysis run described above, ML was conducted twice again with varimax rotation, retaining both 4- and 5-factors with variables loading at a level of 0.4 or greater. The cumulative shared variance explained by 4-factors was 43.86% and there was one double loaded item on factor 1 (23). The cumulative shared variance explained by 5-factors was 46.42%, and there were two items that double loaded on factors 1 and 4 (23 and 25). An additional analysis was conducted for each retained factor, with the double loaded items removed. The cumulative shared variance explained by 4-factors became 45.53% and there were no further double loaded items or changes to the factors. The cumulative shared variance explained by 5-factors became 46.49% and item 4 moved onto factor 4. Upon review of the items in each of the factors retained in both final analyses conducted, the researchers determined that the 4-factor solution matched most closely to the theoretically driven structure of the measure with only one item (15) crossing to an unintended factor. Additionally, the 4-factor solution did not have unreliable items (e.g. item 4 moving to factor 4 on the 2nd run for 5-factors retained). The final factors are: Positive Appraisals of Sleeping Less Than Usual; Negative Appraisals of Sleeping Less Than Usual; Positive Appraisals of Sleeping More Than Usual; and Negative Appraisals of Sleeping More Than Usual. Factor loadings for this solution are displayed in Table 5 and correlations between factors are displayed in Table 6. In addition, an item-level evaluation was conducted. Given the continuous scaling of the items, the percentage of participants who did not rate the item ‘0’ (those who endorsed the item) is displayed in Table 5.
Table 5. Study 3, PANSAM factor loadings, item endorsement and internal consistencies

<table>
<thead>
<tr>
<th>Item</th>
<th>% Endorsed</th>
<th>(+ / ↓)</th>
<th>(- / ↓)</th>
<th>(+ / ↑)</th>
<th>(- / ↑)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. I stay up very late or all night to bring on my elevated mood.</td>
<td>45.2%</td>
<td>.77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. I stay up very late or all night when I have elevated mood, because this is when I feel my best.</td>
<td>63.2%</td>
<td>.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. I stay up very late or all night because of all my good ideas.</td>
<td>64.7%</td>
<td>.67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. I sleep less to give myself a lift.</td>
<td>33.8%</td>
<td>.54</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I stay up very late or all night to avoid feeling like a failure.</td>
<td>45.9%</td>
<td>.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. I have to sleep more than normal to make up for my lost sleep when I’ve been too excited.</td>
<td>68.7%</td>
<td>.48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. The less I sleep, the more likely it is I get everything done.</td>
<td>61.7%</td>
<td>.44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Sleeping less keeps my senses sharp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Really important and successful people don’t need sleep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. If I do not get enough sleep at night, this will have a terrible impact on me the next day.</td>
<td>94.5%</td>
<td>.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. If I do not get enough sleep each night, I won’t be able to function the next day.</td>
<td>98.1%</td>
<td>.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. If I do not get enough sleep each night I will not be able to get done what needs to be done the next day.</td>
<td>95.9%</td>
<td>.79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. If I do not get enough sleep each night, my moods become uncontrollable.</td>
<td>82.3%</td>
<td>.56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. If I do not get enough sleep each night, everyone will think I look exhausted.</td>
<td>88.6%</td>
<td>.54</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. If I do not get enough sleep each night, I become extremely anxious.</td>
<td>90.0%</td>
<td>.46</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
22. The more I worry about not sleeping, the less I sleep.

11. I sleep more to escape from the real world.
19. The only time I can relax is when I am fast asleep.

7. I sleep more to stop myself from doing things I might regret.

3. The only way I can stop myself thinking is to sleep more than normal.

26. If I do not get enough sleep, I could end up causing harm to others.

30. I put off sleep because I am scared what I might dream about.

5. When I sleep more than normal I feel so useless.

29. Sleeping too much is a waste of time.

1. When I sleep more than normal I feel disconnected from everything.

13. Sleep prevents me from completing my many projects.

25. Sleeping too much is a sign that I am becoming depressed.

4. If I only need a few hours of sleep, it is sign that I’m on top of things.

9. When I sleep for too long, I can’t sleep at all the next night.

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>3.72</th>
<th>3.56</th>
<th>2.90</th>
<th>2.46</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of variance</td>
<td>12.83%</td>
<td>12.26%</td>
<td>9.97%</td>
<td>8.47%</td>
</tr>
<tr>
<td>α</td>
<td>.84</td>
<td>.84</td>
<td>.82</td>
<td>.75</td>
</tr>
</tbody>
</table>

Positive Appraisals of Sleeping Less Than Usual = (+ / ↓)
Negative Appraisals of Sleeping Less Than Usual = (- / ↓)
Positive Appraisals of Sleeping More Than Usual = (+ / ↑)
Negative Appraisals of Sleeping More Than Usual = (- / ↑)
### Table 6. Study 3, Pearson correlations between PANSAM factors

<table>
<thead>
<tr>
<th></th>
<th>PANSAM 1 (+/↓)</th>
<th>PANSAM 2 (-/↓)</th>
<th>PANSAM 3 (+/↑)</th>
<th>PANSAM 4 (-/↑)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PANSAM 1 (+/↓)</td>
<td>0.37**</td>
<td>0.55**</td>
<td>0.54**</td>
<td></td>
</tr>
<tr>
<td>PANSAM 2 (-/↓)</td>
<td></td>
<td>0.48**</td>
<td>0.34**</td>
<td></td>
</tr>
<tr>
<td>PANSAM 3 (+/↑)</td>
<td>0.52**</td>
<td></td>
<td>0.52**</td>
<td></td>
</tr>
<tr>
<td>PANSAM 4 (-/↑)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed
Positive Appraisals of Sleeping Less Than Usual = (+/↓)
Negative Appraisals of Sleeping Less Than Usual = (-/↓)
Positive Appraisals of Sleeping More Than Usual = (+/↑)
Negative Appraisals of Sleeping More Than Usual = (-/↑)**

### 5.4.2. Construct validity & Scale Reliability

The mean and standard deviations for each measure and subscale are reported in Table 7. The bi-variate r and rs correlations were highly similar with the exception of three outcomes having a significant relationship for rs, which have been denoted by superscript in Table 8. The correlations indicate the PANSAM factors had significant, positive relationships with high mood tendencies, low mood, poor sleep, sleep distress, the HAPPI, and the DBAS subscales. Further to our expectations, the ISS subscale for wellbeing was negatively associated with all PANSAM factors, but only reached significance at the p < 0.01 level with PANSAM factor 3. The PANSAM also demonstrated acceptable overall scale reliability (Cronbach’s $\alpha = .91$).
### Table 7. Study 3, Mean & standard deviations for measures & subscales

<table>
<thead>
<tr>
<th>Measure &amp; subscales</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>PANSAM 1 (+ / ↓)</td>
<td>20.22</td>
<td>19.07</td>
<td>0-100</td>
</tr>
<tr>
<td>PANSAM 2 (- / ↓)</td>
<td>45.64</td>
<td>22.26</td>
<td>0-100</td>
</tr>
<tr>
<td>PANSAM 3 (+ / ↑)</td>
<td>25.14</td>
<td>23.84</td>
<td>0-100</td>
</tr>
<tr>
<td>PANSAM 4 (- / ↑)</td>
<td>36.36</td>
<td>22.90</td>
<td>0-100</td>
</tr>
<tr>
<td>ISS Conflict</td>
<td>102.50</td>
<td>91.96</td>
<td>0-500</td>
</tr>
<tr>
<td>ISS Wellbeing</td>
<td>146.55</td>
<td>67.25</td>
<td>0-300</td>
</tr>
<tr>
<td>ISS Activation</td>
<td>105.71</td>
<td>92.26</td>
<td>0-500</td>
</tr>
<tr>
<td>ISS Depression</td>
<td>42.84</td>
<td>48.93</td>
<td>0-200</td>
</tr>
<tr>
<td>HYP Total</td>
<td>15.15</td>
<td>8.32</td>
<td>0-48</td>
</tr>
<tr>
<td>PHQ-9 Total</td>
<td>7.10</td>
<td>5.38</td>
<td>0-27</td>
</tr>
<tr>
<td>Global PSQI</td>
<td>6.70</td>
<td>3.68</td>
<td>0-21</td>
</tr>
<tr>
<td>Sleep Distress</td>
<td>35.08</td>
<td>27.32</td>
<td>0-100</td>
</tr>
<tr>
<td>HAPPI Mean</td>
<td>23.96</td>
<td>15.32</td>
<td>0-100</td>
</tr>
<tr>
<td>Consequences Insomnia</td>
<td>49.00</td>
<td>21.78</td>
<td>0-100</td>
</tr>
<tr>
<td>Control &amp; Predictability</td>
<td>30.93</td>
<td>17.75</td>
<td>0-100</td>
</tr>
<tr>
<td>Sleep Requirement Expect.</td>
<td>42.65</td>
<td>17.76</td>
<td>0-100</td>
</tr>
<tr>
<td>Causal attributions</td>
<td>25.46</td>
<td>19.91</td>
<td>0-100</td>
</tr>
<tr>
<td>Sleep Promoting practices</td>
<td>32.27</td>
<td>16.25</td>
<td>0-100</td>
</tr>
</tbody>
</table>

Positive Appraisals of Sleeping Less Than Usual = (+ / ↓)
Negative Appraisals of Sleeping Less Than Usual = (- / ↓)
Positive Appraisals of Sleeping More Than Usual = (+ / ↑)
Negative Appraisals of Sleeping More Than Usual = (- / ↑)
Table 8. Study 3, Pearson correlations between PANSAM factors & additional measures

<table>
<thead>
<tr>
<th>Measure / Subscale</th>
<th>(+ / ↓)</th>
<th>(- / ↓)</th>
<th>(+ / ↑)</th>
<th>(- / ↑)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISS Conflict</td>
<td>0.40**</td>
<td>0.48**</td>
<td>0.56**</td>
<td>0.35**</td>
</tr>
<tr>
<td>ISS Wellbeing</td>
<td>-0.01</td>
<td>-0.11</td>
<td>-0.35**</td>
<td>-0.14*</td>
</tr>
<tr>
<td>ISS Activation</td>
<td>0.56**</td>
<td>0.38**</td>
<td>0.43**</td>
<td>0.38**</td>
</tr>
<tr>
<td>ISS Depression</td>
<td>0.34**</td>
<td>0.32**</td>
<td>0.59**</td>
<td>0.38**</td>
</tr>
<tr>
<td>HYP Total</td>
<td>0.44**</td>
<td>0.28**</td>
<td>0.39**</td>
<td>0.34**</td>
</tr>
<tr>
<td>PHQ-9 Total</td>
<td>0.42**</td>
<td>0.50**</td>
<td>0.65**</td>
<td>0.41**</td>
</tr>
<tr>
<td>Global PSQI</td>
<td>0.27**</td>
<td>0.30**</td>
<td>0.43**</td>
<td>0.27**</td>
</tr>
<tr>
<td>Sleep Distress</td>
<td>0.26**</td>
<td>0.39**</td>
<td>0.36**</td>
<td>0.23**</td>
</tr>
<tr>
<td>HAPPI Mean</td>
<td>0.66**</td>
<td>0.50**</td>
<td>0.62**</td>
<td>0.56**</td>
</tr>
<tr>
<td>Consequences Insomnia</td>
<td>0.11a</td>
<td>0.56**</td>
<td>0.29**</td>
<td>0.11b</td>
</tr>
<tr>
<td>Control &amp; Predictability</td>
<td>0.44**</td>
<td>0.49**</td>
<td>0.57**</td>
<td>0.40**</td>
</tr>
<tr>
<td>Sleep Requirement Expect.</td>
<td>0.10c</td>
<td>0.30**</td>
<td>0.22**</td>
<td>0.17**</td>
</tr>
<tr>
<td>Causal attributions</td>
<td>0.26**</td>
<td>0.23**</td>
<td>0.27**</td>
<td>0.17**</td>
</tr>
<tr>
<td>Sleep Promoting practices</td>
<td>0.36**</td>
<td>0.45**</td>
<td>0.41**</td>
<td>0.20**</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2 – tailed)
* Correlation is significant at the 0.05 level (2 – tailed)

a (rs = 0.15*); b (rs =0.13*); c (rs 0.13*)

Positive Appraisals of Sleeping Less Than Usual = (+ / ↓)
Negative Appraisals of Sleeping Less Than Usual = (- / ↓)
Positive Appraisals of Sleeping More Than Usual = (+ / ↑)
Negative Appraisals of Sleeping More Than Usual = (- / ↑)

5.4.3. Hierarchical Multiple Regression Analysis

Table 9 displays the final β values for each model. Age, gender, and HYP did not contribute significantly to the variance in the model. The DBAS Control and Predictability subscale and PANSAM factor 3 (Positive Appraisals of Sleeping More Than Usual) were both positive, significant predictors of poor sleep quality.
Table 9. Study 3, Hierarchical regression output

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>7.63</td>
<td>1.37</td>
<td>-0.05</td>
</tr>
<tr>
<td>Age</td>
<td>-0.02</td>
<td>0.02</td>
<td>-0.05</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.24</td>
<td>0.61</td>
<td>-0.03</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.56</td>
<td>1.50</td>
<td>0.05</td>
</tr>
<tr>
<td>Age</td>
<td>0.02</td>
<td>0.02</td>
<td>0.05</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.17</td>
<td>0.53</td>
<td>-0.02</td>
</tr>
<tr>
<td>HYP Total</td>
<td>1.08</td>
<td>1.33</td>
<td>0.05</td>
</tr>
<tr>
<td>(DBAS) Consequences of Insomnia</td>
<td>0.01</td>
<td>0.01</td>
<td>0.06</td>
</tr>
<tr>
<td>(DBAS) Control &amp; Predictability of sleep</td>
<td>0.11</td>
<td>0.02</td>
<td>0.53</td>
</tr>
<tr>
<td>(DBAS) Sleep Requirement Expectations</td>
<td>0.00</td>
<td>0.01</td>
<td>-0.00</td>
</tr>
<tr>
<td>(DBAS) Causal Attributions of Insomnia</td>
<td>-0.01</td>
<td>0.01</td>
<td>-0.07</td>
</tr>
<tr>
<td>(DBAS) Sleep Promoting Practices</td>
<td>0.00</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.98</td>
<td>1.55</td>
<td>0.06</td>
</tr>
<tr>
<td>Age</td>
<td>0.02</td>
<td>0.02</td>
<td>0.06</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.37</td>
<td>0.54</td>
<td>-0.04</td>
</tr>
<tr>
<td>HYP Total</td>
<td>0.55</td>
<td>1.38</td>
<td>0.03</td>
</tr>
<tr>
<td>(DBAS) Consequences of Insomnia</td>
<td>0.01</td>
<td>0.01</td>
<td>0.08</td>
</tr>
<tr>
<td>(DBAS) Control &amp; Predictability of sleep</td>
<td>0.09</td>
<td>0.02</td>
<td>0.45**</td>
</tr>
<tr>
<td>(DBAS) Sleep Requirement Expectations</td>
<td>-0.00</td>
<td>0.01</td>
<td>-0.01</td>
</tr>
<tr>
<td>(DBAS) Causal Attributions of Insomnia</td>
<td>-0.01</td>
<td>0.01</td>
<td>-0.07</td>
</tr>
<tr>
<td>(DBAS) Sleep Promoting Practices</td>
<td>-0.00</td>
<td>0.02</td>
<td>-0.00</td>
</tr>
</tbody>
</table>
5.5. Discussion

Using the ICM as a guide, the PANSAM is a theoretically derived measure intended to identify cognitive appraisals for insomnia, hypersomnia, and reduced need for sleep. The aim of this current study was to conduct initial psychometric testing for the PANSAM and explore its predictive usefulness for poor sleep quality. The first step in this study was an EFA. ML extraction using varimax rotation produced a 22-item, 4-factor structure. This structure matched the intended theoretical subscales, with acceptable scale reliability. An item-level evaluation highlighted that PANSAM factor 1 (Positive Appraisals of Sleeping Less Than Usual) was endorsed less than the other three factors. It needs to be taken into account that endorsement of these items could be higher in a clinical sample of people who experience reduced need for sleep.

The second step in this study was to review construct validity. As predicted, the PANSAM subscales were positively associated with validated measures assessing mood states relevant to BD, BD tendency, poor sleep, sleep distress, and cognitive appraisals for both mood and insomnia. There were a couple of observations that indicate the PANSAM is distinctive from the DBAS. First, PANSAM factor 1 (Positive Appraisals of Sleeping Less Than Usual) showed a smaller magnitude that did not reach statistical significance with two subscales of the DBAS (Consequences of Insomnia and Sleep Requirement Expectations). The same was for PANSAM factor 4 (Negative Appraisals of Sleeping More Than Usual) with the Consequences of Insomnia DBAS subscale. It can be argued that these observations should be expected since these measures and subscales are theoretically measuring different constructs. The DBAS was developed for the purpose of assessing for insomnia specific beliefs that are negatively toned (Morin, 1993; Morin et al.,
1993). The PANSAM factor 1 is theoretically intended to assess for positive appraisals about short sleep duration (e.g. reduced need for sleep) whilst PANSAM factor 4 is theoretically intended to assess for negative appraisals about longer than usual sleep duration (e.g. hypersomnia).

Finally, the third step in this study was a hierarchical regression to explore the PANSAM’s predictive usefulness with a validated sleep quality measure. The PANSAM was entered in the regression model following age, gender, BD tendency and the DBAS. Results showed the only significantly associated DBAS subscale was Control and Predictability. This is in line with findings that the items referring to losing control of sleep and the consequences of poor sleep are more strongly endorsed by those with insomnia than normal sleepers (Carney & Edinger, 2006b; Morin et al., 1993). This adds to the evidence that addressing the control and predictability of sleep is important in the maintenance and treatment of sleep disturbances such as insomnia. In addition to the DBAS control subscale, PANSAM factor 3 (Positive Appraisals of Sleeping More than Usual) showed an association when controlling for the previous entered variables in the regression. These statements represent sleep as a safety behaviour (e.g. “I sleep more to escape from the real world”). This highlights important clinical implications about best understanding what the function of sleep is for a person. For example, if the person has strong beliefs that sleeping more will protect them but in fact are struggling with their sleep, this in turn would create a state of conflict. In line with the ICM, we predict this state of conflict is driving the sleep duration variability experienced by those with BD.

The results discussed above highlight a limitation of the PSQI as an adequate measure for indicating poor sleep other than insomnia, such as hypersomnia and reduced need for sleep. Higher scores for the PSQI indicate poor sleep quality as assessed by questions that estimate sleep duration, latency, and frequency and severity of sleep disturbances (e.g. night awakening). The PSQI has shown that those with disorders of initiating and maintaining sleep (e.g. insomnia patients) have significantly higher scores than those with disorders of excessive somnolence (e.g. hypersomnia) (Buysse et al., 1989). Higher scores on the PSQI also do not reflect an accurate assessment of difficulties with reduced need for sleep. For this reason, the PANSAM factors that are theoretically intended to assess for appraisals for reduced need for sleep and hypersomnia would be less likely to show a unique association with the PSQI. Despite the potential constraints of the PSQI, PANSAM factor 3 (Positive Appraisals of Sleeping More than Usual) did show an association when controlling for the previous entered variables in the regression.
Additional limitations should be mentioned. First, we recruited for a general population sample in both student audience spaces (university) and online venues (social media). Due to the convenience sampling method employed, we must be cautious with our assumptions of the results to the general population. Second, this was not a clinical study in which we accurately assessed for those who might meet clinical criteria for mood and sleep disorders. However, the ICM is intended to represent multiple and extreme appraisals that drive mood up and down across the mood continuum, from non-clinical fluctuations to the clinical episodes of depression and mania (Mansell et al., 2007). For this reason, we theorise that the PANSAM should assess for extreme sleep appraisals that map across the sleep continuum that include clinical and non-clinical sleep disturbances.

To the authors’ knowledge, the PANSAM is the first measure to attempt to identify cognitions that maintain a range of sleep duration disturbances commonly experienced by those with BD. This study is a parallel piece of work in a research program to validate and test the PANSAM. The factor structure has matched the intended theoretical subscales for assessing positive and negative appraisals for both sleeping more and less than usual. These extreme appraisals showed significant associations with validated measures assessing high and low mood states, poor quality sleep, and cognitions known to maintain sleep and mood difficulties. Finally, the PANSAM factor for Positive Appraisals of Sleeping More than Usual has shown predictive usefulness with poor sleep quality as measured by the validated PSQI tool. In line with the ICM, further research will test if conflict between the positive and negative factors on the PANSAM predicts sleep variability as assessed by the use of a sleep diary and actigraphy. Additionally, the PANSAM will be compared across clinical groups to determine if the measure is suitable for use with those who experience high and low mood states. This research could help inform therapeutic approaches for working with people who have mood and sleep disturbances.
6. The Positive and Negative Sleep Appraisal Measure: 
Towards a clinical validation of sleep spectrum 
cognitions

This study is currently in preparation for submission to the Sleep journal.
The Positive and Negative Sleep Appraisal Measure: Towards a clinical validation of sleep spectrum cognitions

Lydia Pearson¹,², Sophie Parker¹,², & Warren Mansell¹

¹School of Health Sciences, University of Manchester, Manchester, UK
²Greater Manchester Mental Health NHS Foundation Trust, Manchester, UK

Correspondence concerning this article should be addressed to:

Lydia Pearson, Psychosis Research Unit, Rico House, Greater Manchester Mental Health NHS Foundation Trust, Trust Headquarters, Bury New Road, Prestwich, Manchester, M25 3BL, Tel: +44 (0)161 358 1395. Email address: Lydia.Pearson@gmmh.nhs.uk

Lydia Pearson: ORCID ID - 0000-0003-2890-192X
6.1. Abstract

Sleep disturbance is considered a transdiagnostic process due to the high rate of comorbidity with mental health difficulties. In particular, varying sleep duration disturbances are a feature of mood disorders. To advance transdiagnostic psychological interventions targeting sleep, the Positive and Negative Sleep Appraisal Measure (PANSAM) was developed. The PANSAM is a theory-driven measure representing appraisals for insomnia, hypersomnia, and reduced need for sleep. This study compared the PANSAM with a bipolar spectrum group (n = 22), unipolar depression group (n = 18), and a non-clinical group (n = 22). ANOVA tests revealed the clinical groups scored significantly higher on both the PANSAM and the Dysfunctional Beliefs and Attitudes about Sleep Scale. In addition, the PANSAM scale and subscales showed significant correlations with all clinical measures. Effect sizes are reported due to sample size limitations. This study has initially validated the PANSAM with clinical populations and highlighted its applicability to a transdiagnostic approach.
6.2. Introduction

Sleep disturbances have a high co-occurrence with a wide range of psychological disorders (Benca et al., 1992; Krystal et al., 2008; Ohayon et al., 2000) as both clinical symptoms (American Psychiatric Association, 2013) and recognised in clinical presentations. In addition, there is increasing evidence that sleep disruption is present in at-risk symptomology (Chang, Ford, Mead, Cooper-Patrick, & Klag, 1997; Correll et al., 2007) and before the onset of a mental health relapse (Breslau et al., 1996; Jackson et al., 2003; Scott, 2011). The sleep disturbance insomnia (difficulty falling and staying asleep) is the most common sleep disturbance reported across the disorders (Roth et al., 2006). Much work has been conducted to better understand this sleep disturbance and the cognitive processes that maintain it (Espie, 2007; Harvey, 2002a; Morin, 1993). This has led to the development of CBT for insomnia (CBT-I), which studies have shown improves insomnia symptoms whilst also improving symptoms of the comorbid disorder (Manber et al., 2008; Myers et al., 2011; Wu et al., 2015).

Insomnia is only one sleep disturbance, whereas people often report experiencing a more complex range of sleep disturbances that encompass sleep duration and variability. This range of overlapping sleep disturbances are often reported by people with a diagnosis of bipolar disorder (BD). The BD spectrum is characterised by episodes of elevated and/or depressed mood (American Psychiatric Association, 2013) lasting for different lengths of time. At the shorter duration end, these episodes are considered “at-risk” (Bechdolf et al., 2010; Bechdolf et al., 2014) while mood episodes at the longer duration end (such as four or more days for elevated mood) represent a diagnosis of BD Type I or II. Regardless of the duration of these mood experiences, different sleep disturbances are a feature of BD and are possible clinical symptoms. During elevated mood, a person can experience reduced need for sleep, whilst in a depressed mood a person can experience insomnia or hypersomnia (excessive sleepiness) (Kaplan & Harvey, 2009). Additionally, these changes in sleeping patterns are known to occur before the onset of a mood episode (Correll et al., 2007; Gruber et al., 2011) and between mood episodes (Kaplan et al., 2011; Soehner, Kaplan, & Harvey, 2014). These disturbances are also a potential risk factor for BD, as evidenced in research that has looked at familial risk groups (Duffy et al., 2010; Ng et al., 2015), those who score highly on measures indicating BD personality tendencies (Ankers & Jones, 2009), those who meet the bipolar at-risk (BAR) criteria (Castro et al., 2015) and longitudinally investigated (Ritter et al., 2015).
Sleep and mood have a bi-directional relationship due to the presence of varying sleep disruption at points across the shifting mood spectrum, and so improving sleep could improve mood. However, the complex and contradictory nature of these sleep disturbances means CBT-I will not adequately address the psychological processes maintaining hypersomnia or reduced need for sleep. This has been highlighted by Harvey (2009) who proposed a transdiagnostic CBT sleep intervention with optional modules for different sleep disturbances. Despite the wide breadth of knowledge on insomnia, more research is required to understand the cognitive processes that maintain the additional sleep disturbances. This would better inform the optional modules in a transdiagnostic sleep intervention or any future cognitive therapies.

One such cognitive model that can provide a foundation for understanding these processes is the Integrative Cognitive Model (ICM) of mood swings and bipolar disorders (Mansell et al., 2007). The ICM proposes that the maintaining and escalating mechanisms for mood fluctuations are multiple and contradictory appraisals that enter one’s awareness when a change in internal state is interpreted. These conflicting appraisals can result in a person then engaging in ascent (driving mood up) or descent behaviours (driving mood down) in an attempt to control their internal state. This can lead to shifting elevated and depressed mood states and thus psychological distress. We propose the ICM could explain the cognitive processes that drive and maintain the range of sleep duration disturbances that also fluctuate. An example could be someone who experiences a change to their internal state (e.g. more energy) might then appraise this experience as a need to reduce their sleep in order to take advantage of getting work done whilst feeling energised. This could be in conflict with another appraisal about the negative health effects of not sleeping enough. As these appraisals enter awareness, the person might engage in ascent behaviours (e.g. reducing sleep time along with being more productive) and then at a later point descent behaviours (e.g. cancelling obligations in order to catch up on sleep), resulting in a fluctuating sleep pattern, and ultimately more distress.

In order for cognitive processes to be identified for research purposes and eventually targeted in cognitive therapy, an appropriate and valid patient reported outcome measure (PROM) should be used. In the field of BD, the Hypomanic and Positive Predictions Inventory (HAPPI) (Mansell, 2006) identifies the extreme and multiple appraisals explained in the ICM for those with fluctuating mood. For insomnia, the Dysfunctional Beliefs and Attitudes about Sleep scale (DBAS) (Morin et al., 1993) is most commonly used and has been included in sleep research in the BD field (Chang et al., 2018; Harvey et al., 2005). The DBAS does not, however, account for the wider range of sleep duration
disturbances discussed above. For this reason, the Positive and Negative Sleep Appraisal Measure (PANSAM) was developed in line with the ICM (Pearson, Parker, et al., 2019a) in order to offer a unique and novel assessment of appraisals that may be maintaining insomnia, hypersomnia, and reduced need for sleep together. The PANSAM is a theoretically derived, balanced measure accounting for positive and negative appraisals for both sleeping more than usual (e.g. hypersomnia) and less than usual (e.g. insomnia or reduced need for sleep).

The current study aimed to test the PANSAM in line with the ICM by comparing individuals who experience both elevated and depressed mood states (a BD spectrum group) with two control groups. To replicate a similar study comparing clinical groups with a non-clinical group for the HAPPI (Mansell et al., 2011), a unipolar depression group was recruited in addition to a non-clinical control group. Our primary hypothesis was the BD spectrum group would score higher than the two control groups on the overall PANSAM mean, due to their increased vulnerability to the wide range of sleep disturbances. We also had two secondary hypotheses based on previous research. Both the DBAS (Carney et al., 2010) and the HAPPI (Mansell et al., 2011) have been shown to discriminate between relevant clinical and non-clinical groups, with the HAPPI also distinguishing between those with BD and a unipolar depression group (Alatiq, Crane, Williams, & Goodwin, 2010; Mansell et al., 2011). Based on this, our first secondary hypothesis was the overall DBAS mean would be significantly higher in both the BD spectrum group and the unipolar depression group compared to the non-clinical group. Second, the overall mean for the HAPPI will be significantly higher for the BD group than both the unipolar depression group and the non-clinical group.

6.3. Method

6.3.1. Participants

A total of 65 participants took part in this cross-sectional study, with 62 participants confirmed as eligible and completing in full. An a priori power analysis had been conducted on G*Power (3.0.10) with an alpha = .05 and power = .80. For a moderate to large effect size (f = .33), a sample size of 93 participants were required whereas for a large effect size (f = .40), a sample size of 66 was required. This was based on previous research that has shown a very large effect size (d = 1.58) when comparing clinical BD and a non-clinical control group (Mansell, 2006) and a moderate to large effect size (d = 0.75) when comparing clinical BD and a unipolar depression group for the HAPPI (Mansell et
al., 2011). Due to limited resources and a specific time frame for recruitment, this study recruited adequately only for a large effect size to be shown. There were no significant differences between the three groups for age (F (2, 59) = .63, p = .54) or gender (X2 (2) = .42, p = .85).

Full ethical approval for the study was obtained from the regional NHS Research Ethics Committee. All participants were 18 or over and gave informed consent (See Appendix 15 and 16). Participants were recruited from a variety of sources. The BD spectrum and unipolar depression groups were recruited from primary and secondary services within the local NHS Trust (See Appendix 12). Additionally, eligible people who had participated in previous research studies affiliated with the authors’ research department and who had consented to be contacted about future research opportunities were invited to take part via a postal reply slip. The non-clinical participants were recruited from the university and local community centres. Study leaflets and posters (See Appendix 13) advertised the study in these areas. For all groups, participants were able to self-refer or were referred by the care team working with them.

The SCID-IV-TR was administered to classify the participants according to the inclusion and exclusion criteria (see Table 10). One participant was excluded through these criteria and two participants discontinued taking part before finalising the SCID assessment or questionnaires. Three interviewers conducted the SCID with the participants. All interviewers were trained and proficient in the use of the SCID, each conducting it on separate National Institute of Health Research Trials within the local NHS trust. The author LP conducted the majority of the interviews for all participants (n = 61) and two separate colleagues conducted an interview for one participant each.
Table 10. Study 4, Inclusion & exclusion criteria for each group

<table>
<thead>
<tr>
<th>Group (n)</th>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bipolar Disorder Group</strong></td>
<td>n = 22 Meet current or past criteria for any Bipolar Disorder as confirmed on the SCID-IV-TR. This includes BD Type I, Type II, Cyclothymia, and BD Not Otherwise Specified (NOS). High mood spectrum criteria to determine correct diagnosis ranged from: elevated mood lasting at least 4 hours within a 24 hour period and including two clinically significant symptoms (or three for irritable mood) mania. Meet current or past criteria for Bipolar at Risk Group 3 (Depression + Familial Risk) as defined by Bechdolf et al. (2014).</td>
<td>Clinically significant psychosis symptoms occurring outside an episode of mania or depression. (n = 1)</td>
</tr>
<tr>
<td><strong>Unipolar Depression Group</strong></td>
<td>n = 18 Meet current or past criteria for a depressive disorder. This includes Major Depressive Disorder, Brief Depressive Disorder, and Depressive Disorder NOS.</td>
<td>Clinically significant psychosis symptoms occurring outside an episode of depression, or any elevated mood experiences that would be suitable for BD eligibility.</td>
</tr>
<tr>
<td><strong>Non Clinical Control Group</strong></td>
<td>n = 22 No history or current experiences of depressive or elevated mood experiences that would be eligible for the BD or UPD group.</td>
<td>History of meeting any BD, depression, psychosis, or anxiety disorder.</td>
</tr>
</tbody>
</table>

6.3.2. Materials

6.3.2.1. Positive and Negative Sleep Appraisal Measure (PANSAM)

The PANSAM was developed to assess for extreme positive and negative sleep appraisals a person may endorse with regards to sleeping more or less than usual. A Delphi
A method study was conducted with professionals in the clinical and research field of BD in order to identify and achieve consensus on relevant appraisal statements (Pearson, Parker, et al., 2019a). This study informed the development of the PANSAM statements written with theoretically derived subscales: Positive Appraisals of Sleeping Less Than Usual, Negative Appraisals of Sleeping Less Than Usual, Positive Appraisals of Sleeping More Than Usual, Negative Appraisals of Sleeping More Than Usual. The PANSAM has demonstrated acceptable scale reliability (Cronbach’s α = .91) (Pearson, Mansell, & Sophie, 2019). In this study, participants rated 33-statements (e.g. “The less I sleep, the more likely it is I get everything done”) on a visual analogue scale from 0 (I don’t believe this at all) to 100 (I believe this completely).

6.3.2.2. Internal States Scale (ISS) (Bauer et al., 1991)

The ISS is a 16-item self-report measure designed to assess recent (24 hour) manic and depressive symptoms. The ISS has four empirically derived subscales with acceptable scale reliability (Cronbach’s α): Activation (α = .92), Well-being (α = .84), Perceived Conflict (α = .87), and Depression Index (α = .81). These have been shown to discriminate mood states in BD (Bauer et al., 1991; Bauer et al., 2000; Cooke et al., 1996). Participants completed questions 1-15 using a visual analogue scale from 0 (not at all / rarely) to 100 (very much so / much of the time). Question 16 asked the participant to rate how they feel, using a visual analogue scale from -50 (depressed / down) to 0 (normal) to +50 (manic / high).

6.3.2.3. Young Mania Rating Scale (YMRS) (Young et al., 1978)

The YMRS is an 11-item scale that assesses a person’s subjective report of his or her clinical condition and relevant manic symptoms. The inter-rater reliability is reported to be between .84-.93 and the internal consistency to be .80 (Dew, Switzer, Myaskovsky, DiMartini, & Tovt-Korshynska, 2005).

6.3.2.4. Beck Depression Inventory (BDI) (Beck et al., 1988)

The BDI is a 21-item multiple-choice, self-report questionnaire measuring the severity of depression across the past two weeks. The score cut-offs for depression severity is 0 – 9 for normal range, 10 – 18 for mild to moderate depression, 19-29 for moderate to severe depression, and 30 – 63 for severe depression. Scale reliability was found to be acceptable for both psychiatric (Cronbach’s α 0.86) and non-psychiatric (Cronbach’s α 0.81) populations.

6.3.2.5. Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989)
Pittsburgh Sleep Quality Index (PSQI) is a 19-item self-report measure assessing sleep quality during the previous month. It is comprised of seven components measuring subjective sleep quality, latency, duration, efficiency, disturbances, use of sleeping medications, and daytime functioning. These components are then totalled for a global PSQI score that has a range of 0-21, with higher scores indicating worse sleep quality. Scale reliability is acceptable (Cronbach’s $\alpha$ 0.83).

6.3.2.6. Hypomanic Attitudes & Positive Predictions Inventory (HAPPI) (Mansell, 2006)

The HAPPI is a 61-item self-report measure assessing for the multiple, extreme, and personalised appraisals about high and low mood. Participants rate the statements using a visual analogue scale from 0 (I don’t believe this at all) to 100 (I believe this completely). The HAPPI has a 6-factor structure with acceptable scale reliability: Social Self-Criticism (Cronbach’s $\alpha$ .90), Increasing Activation to Avoid Failure (Cronbach’s $\alpha$ 0.83), Success Activation and Triumph Over Fear (Cronbach’s $\alpha$ 0.86), Loss of Control (Cronbach’s $\alpha$ 0.87), Grandiose Appraisals of Ideation (Cronbach’s $\alpha$ 0.83) and Regaining Autonomy (Cronbach’s $\alpha$ 0.80) (Dodd, Mansell, et al., 2011b).

6.3.2.7. Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS) (Morin et al., 1993)

The DBAS is a 28-item scale that assesses for a range of beliefs, attitudes, expectations, and attributions about sleep and insomnia. Five conceptually derived themes comprise the scale: Consequences of Insomnia, Control and Predictability of Sleep, Sleep Requirement Expectations, Causal Attributions of Insomnia, and Sleep-Promoting Practices. Participants rated the statements (e.g. “I need 8 hours of sleep to feel refreshed and function well during the day”) on a visual analogue scale from 0 (Strongly disagree) to 100 (Strongly agree). Item 23 is reverse scored, and higher scores indicate a dysfunctional belief. The DBAS scale has acceptable scale reliability with both good (Cronbach’s $\alpha = 0.80$) and poor (Cronbach’s $\alpha = 0.81$) adult sleepers.

6.3.3. Data Analysis

For the participant characteristics and sleep and mood variables, group comparisons were analysed with chi-square tests or with a one-way analysis of variance (ANOVA). Chi-square analyses were conducted for categorical variables, with Fishers exact test reported in footnote when the cell size was <5. The ANOVA’s were followed by post hoc LSD tests to explore significant effects. Due to the robustness of the ANOVA test, the assumption of
normality was determined as Skew < 2 and Kurtosis < 9 (Boneau, 1960; Possten, 1984; Schmider, Ziegler, Danay, Beyer, & Bühner, 2010). In instances when this was violated, the non-parametric Kruskal-Wallis test with post hoc Mann-Whitney test was conducted for comparison. Additionally, where the equal variance assumption was not upheld (as determined by the Levene’s test) the Welch test and subsequent Games-Howell’s post-hoc tests were conducted and reported. In line with the a priori power calculation, a significance level of \( p < .05 \) was used.

6.4. Results

The participants’ clinical and measure characteristics are provided in Tables 11 and 12. For the BD spectrum and unipolar depression groups, chi square analyses showed no significant difference between the groups for current psychotropic medication use, having had psychological therapy, meeting a current major depressive episode (MDE) or reporting current insomnia or hypersomnia. Significant differences were shown with the BD spectrum group reporting current high mood spectrum experiences and reduced need for sleep as compared to the unipolar depression group. For the mood and sleep measure variables, ISS activation was the only variable in which the unipolar depression group scored significantly higher than the non-clinical group. The remaining measures all showed significant differences for both the BD spectrum and unipolar depression groups compared with the non-clinical group.
Table 11. Study 4, Participant clinical characteristics across the groups

<table>
<thead>
<tr>
<th></th>
<th>BD (N = 22)</th>
<th></th>
<th>UPD (N = 18)</th>
<th></th>
<th>NC (N = 22)</th>
<th></th>
<th>Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>F (2, 60) = .604, p = .55</td>
</tr>
<tr>
<td>Age</td>
<td>34.0</td>
<td>11.7</td>
<td>37.3</td>
<td>15.4</td>
<td>38.7</td>
<td>16.7</td>
<td></td>
</tr>
<tr>
<td>No. on psychotropic medication</td>
<td>15</td>
<td>68</td>
<td>9</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>$X^2 (1) = 1.36, p = .24$</td>
</tr>
<tr>
<td>No. had psychological therapy</td>
<td>18</td>
<td>82</td>
<td>10</td>
<td>56</td>
<td>-</td>
<td>-</td>
<td>$X^2 (1) = 3.25, p = .07$</td>
</tr>
<tr>
<td>Meets current MDE (%)</td>
<td>7</td>
<td>32</td>
<td>10</td>
<td>56</td>
<td>-</td>
<td>-</td>
<td>$X^2 (1) = 2.28, p = .13$</td>
</tr>
<tr>
<td>Meets current high mood spectrum (%)</td>
<td>11</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>$X^2 (1) = 12.41, p &lt; .001^1$</td>
</tr>
<tr>
<td>Meets current insomnia</td>
<td>4</td>
<td>18</td>
<td>6</td>
<td>33</td>
<td>-</td>
<td>-</td>
<td>$X^2 (1) = 1.21, p = .27^2$</td>
</tr>
<tr>
<td>Meets current hypersomnia</td>
<td>2</td>
<td>9</td>
<td>2</td>
<td>11</td>
<td>-</td>
<td>-</td>
<td>$X^2 (1) = .05, p = .83^3$</td>
</tr>
<tr>
<td>Meets current reduced need for sleep</td>
<td>6</td>
<td>27</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>$X^2 (1) = 5.78, p = .02^4$</td>
</tr>
</tbody>
</table>

^1 = 1 cell (25%) has expected count less than 5 (4.95). Fishers exact test – p < .001
^2 = 1 cell (25%) has expected count less than 5 (4.50). Fishers exact test - p = .30
^3 = 2 cells (50%) have expected count less than 5 (1.80). Fishers exact test - p = 1.00
^4 = 2 cells (50%) have expected count less than 5 (2.70). Fishers exact test – p = .0
Table 12. Study 4, Participant measure characteristics across the groups

<table>
<thead>
<tr>
<th>Measures</th>
<th>BD</th>
<th>UPD</th>
<th>NC</th>
<th>Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
</tbody>
</table>
| ISS conflict      | 108.9\(_a\) | 95.9   | 128.9\(_a\) | 104.2 | 20.2\(_b\) | 22.4 | F(2, 59) = 9.55, p < .001  
| ISS well-being    | 122.3\(_a\) | 70.1   | 105.6\(_a\) | 82.8  | 196.4\(_b\) | 62.1 | F(2, 36) = 4.55, p = .02  
| ISS activation    | 120.2  | 125.0  | 138.6\(_a\) | 122.7 | 50.7\(_b\) | 79.6 | F(2, 31) = 13.6, p < .001 \(^1\) |
| ISS depression    | 60.9\(_a\) | 56.0   | 84.7\(_a\) | 70.0  | 11.8\(_b\) | 25.9 | F(2, 28) = 24.60 (p < .001) \(^1\) |
| BDI               | 21.4\(_a\) | 16.5   | 25.9\(_a\) | 16.9  | 3.6\(_b\) | 4.5  | F(2, 34) = 11.53 (p < .001) \(^1\) |
| YMRS              | 5.3\(_a\) | 4.9    | 3.3\(_a\) | 1.9   | 1.4\(_b\) | 1.3  | F(2, 29) = 36.52 (p < .001) \(^1\) |
| GAD               | 16.5\(_a\) | 6.6    | 17.8\(_a\) | 5.7   | 8.2\(_b\) | 1.8  | F(2, 37) = 8.77 (p = .001) \(^1\) |
| PSQI              | 9.0\(_a\) | 5.3    | 10.6\(_a\) | 4.7   | 5.4\(_b\) | 3.5  | F(2, 33) = 11.72 (p < .001) \(^1\) |
| Sleep Distress    | 40.2\(_a\) | 38.6   | 54.4\(_a\) | 34.2  | 14.4\(_b\) | 18.6 | F(2, 34) = 16.59 (p < .001) \(^1\) |
| HAPPI Mean        | 37.8\(_a\) | 20.5   | 27.6\(_a\) | 19.4  | 10.7\(_b\) | 11.2 |                                           |

\(^1\) = Welch’s test reported, with Games-Howell post-hoc
Different subscripts indicate significant differences: LSD or Games-Howell p < .05
The primary hypothesis concerned the difference on the overall PANSAM mean between the BD spectrum group and the control groups (see Fig. 8). First, the PANSAM demonstrated acceptable overall scale reliability (Cronbach’s $\alpha = .94$). Regarding the overall difference between groups, the degree of overlap in the error bars represents the outcomes of pairwise comparisons ($p < .05$). This hypothesis was partially supported due to a post-hoc LSD test showing the PANSAM mean $[F (2, 59) = 17.02 (p < .001)]$ was significantly higher in both the BD and UPD groups (both with an effect size of $d = 1.6$) compared to the non-clinical group. No statistically significant difference was shown between the two clinical groups (effect size $d = .09$). ANOVA’s were conducted with the individual subscales to identify any differences between the groups. For ‘Positive Appraisals of Sleeping Less Than Usual’ $[F (2, 32) = 8.90 (p = .001)]$, ‘Negative Appraisals of Sleeping Less Than Usual’ $[F (2, 59) = 8.05 (p = .001)]$, ‘Positive Appraisals of Sleeping More Than Usual’ $[F (2, 29) = 27.06 (p < .001)]$, and ‘Negative Appraisals of Sleeping More Than Usual’ $[F (2, 59) = 11.89 (p < .001)]$, post-hoc LSD and Games-Howell tests showed significant differences with both the BD spectrum and unipolar depression groups scoring significantly higher than the non-clinical group. For additional information, the individual groups’ means and standard deviations have been reported in Table 13.

Our secondary hypothesis concerned the difference on the overall DBAS mean for the BD spectrum and unipolar depression groups with the non-clinical group. This hypothesis was supported due to the post-hoc LSD test showing the DBAS Mean $[F (2, 59) = 11.04 (p < .001)]$ was significantly higher for both clinical groups (BD effect size: $d = 1.3$; UPD effect size: $d = 1.2$) compared to the non-clinical group. ANOVA’s were conducted with the individual subscales to identify any differences between the groups. For ‘Consequences’ $[F (2, 59) = 6.42 (p = .003)]$, ‘Control’ $[F (2, 35) = 18.75 (p < .001)]$, and ‘Practices’ $[F (2, 59) = 5.45 (p = .007)]$, post-hoc LSD and Games-Howell tests all revealed that the BD spectrum and unipolar depression groups scored significantly higher than the non-clinical group. For ‘Expectations’ $[F (2, 39) = 3.37 (p = .045)]$, the post-hoc Games-Howell test showed only the unipolar depression group was significantly higher than the non-clinical group. For ‘Attributions’ $[F (2, 59) = 1.90 (p = .158)]$, there were no statistical differences between the groups.
Figure 8. Study 4, Mean PANSAM scores across the groups

Note: Error bars denote 95% confidence intervals.

Positive Appraisals of Sleeping Less Than Usual = (+ / ↓)
Negative Appraisals of Sleeping Less Than Usual = (- / ↓)
Positive Appraisals of Sleeping More Than Usual = (+ / ↑)
Negative Appraisals of Sleeping More Than Usual = (- / ↑)
Positive Appraisals of Sleeping Less Than Usual = (+ / ↓)

Table 13. Study 4, PANSAM subscale mean and standard deviations

<table>
<thead>
<tr>
<th>PANSAM subscale</th>
<th>BD Mean</th>
<th>BD SD</th>
<th>UPD Mean</th>
<th>UPD SD</th>
<th>NC Mean</th>
<th>NC SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>(+ / ↓)</td>
<td>22.5</td>
<td>20.3</td>
<td>22.7</td>
<td>23.4</td>
<td>5.6</td>
<td>9.7</td>
</tr>
<tr>
<td>(- / ↓)</td>
<td>53.1</td>
<td>26.8</td>
<td>56.6</td>
<td>25.7</td>
<td>27.9</td>
<td>23.3</td>
</tr>
<tr>
<td>(+ / ↑)</td>
<td>41.5</td>
<td>28.7</td>
<td>41.8</td>
<td>28.1</td>
<td>5.6</td>
<td>8.4</td>
</tr>
<tr>
<td>(- / ↑)</td>
<td>47.0</td>
<td>24.5</td>
<td>42.8</td>
<td>25.2</td>
<td>15.7</td>
<td>19.1</td>
</tr>
</tbody>
</table>

Positive Appraisals of Sleeping Less Than Usual = (+ / ↓)
Negative Appraisals of Sleeping Less Than Usual = (- / ↓)
Positive Appraisals of Sleeping More Than Usual = (+ / ↑)
Negative Appraisals of Sleeping More Than Usual = (- / ↑)
Due to both the PANSAM and the DBAS being elevated in the clinical groups compared to the non-clinical group, we conducted post-hoc Pearson correlations between the sleep cognition measures and the clinical mood, sleep, and anxiety measures (see Tables 14 and 15). The purpose of this was to see whether the PANSAM and DBAS correlated with a wider range of psychopathology. The PANSAM mean and subscales were all correlated with each of the clinical measures. For the DBAS, the mean and subscales ‘Consequences’, ‘Control’, and ‘Practices,’ were all correlated with each of the measures. The subscales ‘Expectations’ and ‘Attributions’ were less so, with ‘Expectations’ only correlating with the anxiety measure and ‘Attributions’ only correlating with the elevated mood measure.

Table 14. Study 4, PANSAM correlations with mood, sleep and anxiety

<table>
<thead>
<tr>
<th></th>
<th>PANSAM</th>
<th>PANSAM</th>
<th>PANSAM</th>
<th>PANSAM</th>
<th>PANSAM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>(+ / ↓)</td>
<td>(- / ↓)</td>
<td>(+ / ↑)</td>
<td>(- / ↑)</td>
</tr>
<tr>
<td>BDI</td>
<td>.759**</td>
<td>.601**</td>
<td>.599**</td>
<td>.648**</td>
<td>.609**</td>
</tr>
<tr>
<td>YMRS</td>
<td>.559**</td>
<td>.532**</td>
<td>.333**</td>
<td>.417**</td>
<td>.492**</td>
</tr>
<tr>
<td>PSQI</td>
<td>.624**</td>
<td>.503**</td>
<td>.423**</td>
<td>.463**</td>
<td>.529**</td>
</tr>
<tr>
<td>Sleep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distress</td>
<td>.701**</td>
<td>.534**</td>
<td>.591**</td>
<td>.563**</td>
<td>.505**</td>
</tr>
<tr>
<td>GAD</td>
<td>.696**</td>
<td>.577**</td>
<td>.550**</td>
<td>.521**</td>
<td>.556**</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed)

Table 15. Study 4, DBAS correlations with mood, sleep and anxiety

<table>
<thead>
<tr>
<th></th>
<th>DBAS</th>
<th>Consequences</th>
<th>Control</th>
<th>Expectations</th>
<th>Attributions</th>
<th>Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BDI</td>
<td>.655**</td>
<td>.501**</td>
<td>.756**</td>
<td>.226</td>
<td>.172</td>
<td>.489**</td>
</tr>
<tr>
<td>YMRS</td>
<td>.517**</td>
<td>.332**</td>
<td>.587**</td>
<td>.195</td>
<td>.371**</td>
<td>.415**</td>
</tr>
<tr>
<td>PSQI</td>
<td>.585**</td>
<td>.420**</td>
<td>.726**</td>
<td>.124</td>
<td>.042</td>
<td>.452**</td>
</tr>
<tr>
<td>Sleep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distress</td>
<td>.684**</td>
<td>.557**</td>
<td>.785**</td>
<td>.222</td>
<td>.091</td>
<td>.533**</td>
</tr>
<tr>
<td>GAD</td>
<td>.639**</td>
<td>.491**</td>
<td>.718**</td>
<td>.263*</td>
<td>.161</td>
<td>.499**</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)
Our additional secondary hypothesis concerned the difference on the overall HAPPI mean for the BD spectrum group compared to the unipolar depression and non-clinical groups. This hypothesis was partially supported since the post-hoc Games-Howell test showed that both the BD spectrum (effect size $d = 1.6$) and unipolar depression (effect size $d = 1.1$) groups scored significantly higher than the non-clinical group (see Table 12). No statistically significant difference was found between the two clinical groups (effect size $d = .51$).

6.5. Discussion

Our primary hypothesis regarding the overall PANSAM mean score was only partially supported. Both the clinical groups scored significantly higher than the non-clinical group, but no difference was shown between the two clinical groups. We had expected that due to the BD spectrum group having an increased vulnerability to a wider range of sleep duration disturbances, this clinical group would be significantly different on the PANSAM from the unipolar depression group. One reason for the finding may be the lack of distinction between the two groups based on clinical features. As expected, both groups were not significantly different from one another with regards to current low mood or reports of currently experiencing insomnia or hypersomnia. This means the two groups could equally agree with the appraisals on the PANSAM that represent insomnia (negative appraisals of sleeping less than usual) and hypersomnia (positive and negative appraisals of sleeping more than usual). We did, however, expect the distinguishing feature of the BD spectrum group would be experiences of high mood. Although the BD spectrum group reported more current high mood experiences and reduced need for sleep disturbances, there was no difference between the groups for the clinical measure of hypomanic experiences (YMRS). Additionally, the unipolar spectrum group scored significantly higher on the activation subscale on the ISS compared to the BD spectrum group. The ISS subscale has been shown to significantly correlate with the YMRS and with episodes of mania (Bauer et al., 1991). This suggests the unipolar depression group recruited for this study had some vulnerability to high or activated mood in the previous 24 hours that was captured on the ISS over and above the BD spectrum group. This could be the reason why both groups were not different from one another on the subscale of the PANSAM that is designed to distinguish reduced need for sleep appraisals (positive appraisals for sleeping less than usual). It is important to note that although the overall mean and individual subscale scores of the PANSAM each differentiated the clinical samples from the non-clinical sample, the mean scores for the reduced need for sleep subscale (positive appraisals of sleeping less) were
lower compared to the other three subscales. This lends some caution to interpreting the overall PANSAM mean score as equally representing positive and negative conflict.

As expected, our secondary hypothesis regarding the DBAS was supported. Both the BD spectrum group and the unipolar depression group had significantly higher DBAS mean scores than the non-clinical group. For our secondary hypothesis regarding the HAPPI, we expected the HAPPI mean score would differentiate between the two clinical groups as well as the non-clinical group based on previous research (Alatiq et al., 2010; Mansell et al., 2011). This was only partially supported since both the BD spectrum group and the unipolar depression group were significantly higher than the non-clinical group. A statistically significant distinction was not made between the two clinical groups however.

There are several possible reasons why this result was not in line with previous findings. The first is this study did not recruit sufficiently for an accurate moderate to large effect size (d = 0.75) to be shown between the two clinical groups, as was shown in the study by Mansell et al. (2011). In addition, the BD spectrum group recruited included a range of BD spectrum criteria from the at-risk end of high mood experiences (e.g. hours at a time) up to past history of a manic episode. This is a different BD group compared to the BD groups recruited in previous studies. In both the Alatiq et al. (2010) and Mansell et al. (2011) studies, the difference was shown with the BD group comprised of those who had a history of a manic or hypomanic episode rather than including participants with experiences of sub-threshold high mood. This is in line with the suggestion that the cognitive style the HAPPI assesses for represents a vulnerability to BD that is greater in those with more significant elevated mood experiences (Mansell et al., 2007). Finally, as noted above regarding the unipolar depression group scoring higher on the activation subscale compared to the BD spectrum group, these two groups might not be as distinguishable as intended.

In addition to our original hypotheses, we also looked more closely at the individual subscales of both the PANSAM and the DBAS and correlations with the clinical measures. Although the sample groups were not separated for this correlational analysis, and so we must be cautious with the inferences made, each of the PANSAM subscales statistically differentiated the clinical groups from the non-clinical control group and were all significantly correlated with the clinical measures for sleep, mood, and anxiety. The results were less consistent for the DBAS subscales, with only the ‘Consequences’, ‘Control’, and ‘Practices’ subscales differentiating both the clinical groups from the non-clinical group and showing significant correlations with each clinical measure. Despite the ‘Expectations’ and ‘Attributions’ subscales showing less statistical differences and correlations, both the
DBAS and the PANSAM highlight the importance of sleep disruptive cognitions that are present for those experiencing mood disturbances. Previous research has shown that even when controlling for depressive symptoms, sleep disruptive cognitions remained more pathological for those with a mood disturbance than primary insomnia patients (Carney, Edinger, Manber, Garson, & Segal, 2007). This adds to the evidence that targeting disruptive sleep-related cognitions in psychological therapy could improve sleep disturbances that are comorbid with affective disorders.

In addition to both sleep cognition measures highlighting sleep disruptive cognitions present across the mood spectrum, the PANSAM and DBAS also highlight applicability with a transdiagnostic approach. The sleep disruptive cognitions are present for, and correlated with, those who experience mood, sleep, and anxiety difficulties. This could be explained by the clinical groups being more susceptible to the dimension of General Psychopathology, or the “p” factor. Caspi et al. (2014) propose “p” influences the presence or absence of psychiatric symptoms, with higher “p” scores reflecting higher psychopathology severity, duration, and comorbidity. Perhaps the clinical participants in this study represent those who would score higher on the “p” factor. The authors explain that as “p” increases and the disorder(s) become more severe, disordered thoughts become more prevalent. These thoughts can then be targeted in CBT interventions. The DBAS is already currently used for identifying disruptive sleep cognitions specific to insomnia in CBT-I (Edinger et al., 2001). The outcome of this study highlights the PANSAM as a theory-driven and well-balanced measure for a range of sleep duration cognitions that has shown initial validation with clinical mood populations.

The results need to be interpreted within the confines of several limitations. The first is the sample size. We had aimed to recruit at least 66 people for a large effect size. Unfortunately, we achieved just under this target due to time and resource constraints. For this reason, possible distinctions between the clinical groups may not have been shown. Additionally, we kept the significance level of p < .05 for all comparisons rather than employing a more conservative significance level. This was agreed for consistency with the main hypotheses and the a priori power calculation, although it does mean we may not have adequately controlled for Type I errors. Finally, our sample groups may not have represented those who experience activated mood states as clearly as we had expected. The unipolar depression group scored higher on an activation subscale, and the BD spectrum group represented a range of high mood experiences from the at-risk end up to those who had a history of mania. Future research could compare the PANSAM subscales with separate clinical groups who meet varying degrees of elevated mood experiences, in order
to see if the reduced need for sleep subscale differentiates between clinical groups. This may also highlight if there are particular clinical groups (e.g. those in a current hypomanic or manic episode) who endorse these beliefs more and thus score higher on this subscale.

More research should be conducted to further test the role of the PANSAM in line with the ICM. This can include investigating whether the conflicting appraisals represented in the PANSAM predict sleep related variability and distress. Finally, the PANSAM should be investigated further with additional clinical groups to better understand applicability as a transdiagnostic tool for use in CBT interventions.

6.6. Acknowledgements

Thank you to the services in GMMH who supported with the recruitment for this study, and the participants who took part. Thank you to Professor Graham Dunn who supported with the initial statistical support for the protocol. Thank to you Dr. Measha Bright & Emmeline Joyce who supported with participant recruitment and each conducted a SCID interview.
7. Do extreme, conflicting beliefs about sleep duration predict sleep variability? A sleep diary and actigraphy study

A journal has not been identified for this study yet. The author (LP) will be working towards preparing this study for submission to an appropriate one.
Do extreme, conflicting beliefs about sleep duration predict sleep variability? A sleep diary and actigraphy study

Lydia Pearson\textsuperscript{1,2}, Warren Mansell\textsuperscript{1}, & Sophie Parker\textsuperscript{1,2}

\textsuperscript{1}School of Health Sciences, University of Manchester, Manchester, UK

\textsuperscript{2}Greater Manchester Mental Health NHS Foundation Trust, Manchester, UK

Correspondence concerning this article should be addressed to:

Lydia Pearson, Psychosis Research Unit, Rico House, Greater Manchester Mental Health NHS Foundation Trust, Trust Headquarters, Bury New Road, Prestwich, Manchester, M25 3BL, Tel: +44 (0)161 358 1395. Email address: Lydia.Pearson@gmmh.nhs.uk

Lydia Pearson: ORCID ID - 0000-0003-2890-192X
7.1. Abstract

**Objective & Background:** The Positive and Negative Sleep Appraisals Measure (PANSAM) is a theoretically derived measure intended to identify the conflicting appraisals about sleep duration disturbances (insomnia, hypersomnia, and reduced need for sleep). This is based on the Integrative Cognitive Model developed in the field of bipolar disorder. The aim of this study is to test if the PANSAM predicts subjective and objective total sleep time variability, and the incremental validity of the PANSAM with other associated mood and sleep variables.

**Participants:** A university sample (n = 66) were recruited from student audience spaces.

**Methods:** Participants completed the PANSAM as well as additional validated measures of mood, sleep quality, and mood and sleep cognitions. Participants also completed a sleep diary and wore an actigraph watch for 14 days.

**Results:** A Pearson correlation showed a significant positive correlation with objective total sleep time variability only. A hierarchical regression tested incremental validity of the PANSAM, but this was not upheld with the addition of a bipolar trait measure and a commonly used insomnia cognition measure. An important finding was the subscale of the PANSAM representing elevated mood sleep disturbances and two hypomanic-relevant measures all correlated significantly with both subjective and objective total sleep time variability.

**Conclusions:** These findings contribute to the overall psychometric validation of the PANSAM and highlight the importance of the hypomanic endophenotype in sleep variability. Future work with clinical groups can investigate this further.
7.2. Introduction

An increasing body of research and literature highlights that sleep and mood are closely linked, and this relationship is complex and bidirectional. Kahn et al. (2013) describe this relationship as a “vicious cycle” in which disrupted sleep compromises emotional regulation. This in turn further disrupts sleep, resulting in additional emotional well-being difficulties. This cycle is evident across the range of mental health disorders (Krystal et al., 2008), and in particular for those who experience mood disorders (Benca et al., 1997) such as bipolar disorder (BD). BD is a mood disorder characterised by at least one episode of elevated or irritable mood and/or episodes of depressed mood (American Psychiatric Association, 2013). The sleep disturbances insomnia (difficulty falling and staying asleep), hypersomnia (excessive sleepiness), and reduced need for sleep are clinical symptoms of these mood episodes, but are also present during an inter-episode period and can escalate before a mood relapse occurs.

In order to combat this vicious cycle, as is evident in BD, it is important to better understand the psychological processes that exacerbate and maintain the disrupted sleep and emotional well-being difficulties. This has the potential of helping to identify at-risk individuals, prevent relapse, and improve psychological interventions such as Cognitive behaviour therapy (CBT). CBT is an established and evidence-based psychological intervention for many disorder-specific difficulties including insomnia (van der Zweerde et al., 2019) and bipolar disorder (BD) (Chiang et al., 2017). Regarding insomnia, over the last several decades there has been a wealth of research investigating the psychological processes underpinning this sleep disturbance. This has informed the Cognitive Model of Insomnia which highlights attention, perception, counterproductive safety behaviours and erroneous beliefs as all playing a role in associated arousal and distress that affect sleep (Harvey, 2002a). In addition, CBT for Insomnia (CBT-I) has become the most prominent nonpharmacologic treatment for this sleep disorder and has been shown to improve both symptoms of insomnia and comorbid disorders (Manber et al., 2008; Myers et al., 2011; Wu et al., 2015).

As evident in BD, insomnia is not the only sleep disturbance and attention should be given to the psychological processes underpinning hypersomnia and reduced need for sleep. In a scoping review identifying the sleep cognition measures developed specifically for sleep disturbances characterised by impaired total sleep time, it was highlighted that none were developed specifically for hypersomnia or reduced need for sleep (Pearson et al., 2018). In response, the Positive and Negative Sleep Appraisal Measure (PANSAM) was developed
in order to account for conflicting, positive and negative appraisals that may drive and maintain the range of sleep duration disturbances that fluctuate (Pearson, Parker, et al., 2019a). These appraisals include “I will stay up very late or all night to avoid feeling bored” and “I sleep more to escape from the real world.” As these conflicting appraisals enter ones awareness, the person may engage in behaviours that then drive their sleep up (hypersomnia) or down (reduced need for sleep).

This measure is based on the Integrative Cognitive Model (ICM), which was developed in the field of BD and is guided by previous research that proposed internal attributions in response to circadian rhythm disruption increases BD vulnerability and symptoms (Healy & Williams, 1989; Jones, 2001). The ICM expands on this to propose that multiple and extreme appraisals about mood, in response to changes in internal state, play an important role in driving mood up into an elevated state (via ascent behaviours) and down into a depressed state (via descent behaviours) (Mansell et al., 2007) leading to mood swings. These appraisals are measured by the Hypomanic Attitudes and Positive Predictions Inventory (HAPPI) (Mansell, 2006), which has distinguished between those with BD, unipolar depression and a non-clinical control group (Mansell et al., 2011) and is a significant predictor of bipolar-relevant states over a 4-day period in a student-sample (Dodd, Mansell, Bentall, & Tai, 2011).

Although the ICM was developed in the area of BD research, it is not disorder-specific since the mechanism for maintaining and escalating mood fluctuations could also apply to sub-clinical mood swings and mood fluctuations experienced in other disorders (Mansell et al., 2007). This transdiagnostic strength of the model means the same mechanism could explain different fluctuating patterns such as sleep disturbances. The PANSAM represents the multiple and extreme appraisals about sleep that may play an important role in sleep duration increasing or decreasing as experienced by those who fluctuate between insomnia, hypersomnia, and reduced need for sleep. The PANSAM has already been shown to distinguish mood disorder clinical groups from non-clinical controls (Pearson, Parker, & Mansell, 2019b). In addition, a hierarchical regression identified the PANSAM subscale for Positive Appraisals of Sleeping More than Usual to be a significant predictor for poor sleep quality in a university sample. Based on the theory of the ICM that oscillation is driven by extreme, conflicting appraisals the next critical step in evaluating the validity of the PANSAM is to test if it predicts a person’s sleep shifting from short to long duration sleep disturbances night by night. In order to best capture this sleep variability, both subjective and objective sleep measurements for total sleep time (TST) were recorded across a 24-hour period for 14 days. Additional established measures for mood and sleep
were included. The primary hypothesis for this study was the PANSAM would predict both subjective and objective TST variability. We also tested the incremental validity of the PANSAM with associated established measures.

7.3. Method

7.3.1. Participants

Ethical approval for this study was obtained by the university (ref: 16314) with Research Ethics Committee 2. A university sample (n = 66) were recruited via convenience sampling to take part in this two week diary and actigraphy study. This study was advertised at the university (See Appendix 19), with undergraduate psychology students able to earn credits for taking part. One participant did not complete the study in full and this data was not included, leaving n = 65 (98% of original participant recruitment). A second participant’s actigraphy data was lost during the two-week period leaving n = 64 for actigraphy analysis only (97% of original dataset). The participant characteristics were as follows: gender [male: n = 11 (16.7%); female: n = 54 (81.8%)], age (mean = 29, SD = 10.9), and ethnicity [white British: n = 38 (57.6%); white other: n = 18 (27.2%); Oriental: n = 3 (4.5%); Indian: n = 2 (3%); Asian or Asian British: n = 2 (3%); and Caribbean: n = 2 (3%)].

7.3.2. Design

The independent variable (IV) for this study was the mean PANSAM score, representing sleep appraisal conflict (see Measures below for details). The dependent variable’s (DV) were an index for both objective and subjective total sleep time (TST) variability. To evaluate TST variability, the sum of squared differences between the time periods was calculated. This computation has been used in previous studies for mood (Knowles et al., 2007) and weight fluctuations (Rosenhead & Mansell, 2015) and better represents point-to-point change compared to variance or standard deviation. The associations of the variables were conducted using Pearson’s correlational analysis. In order to test incremental validity, multiple regression analyses were applied for any variables that were significantly related to the DV.

7.3.3. Measures

7.3.3.1. Positive and Negative Sleep Appraisal Measure (PANSAM)

The PANSAM was developed to assess for extreme positive and negative sleep appraisals a person may endorse in regards to sleeping more or less than usual. A Delphi method
study (Pearson, Parker, et al., 2019a) conducted with professionals in the clinical and research field of BD informed the development of the PANSAM. In a follow-up study (Pearson, Mansell, et al., 2019), an exploratory factor analysis confirmed four theoretically derived subscales: Positive Appraisals of Sleeping More Than Usual, Negative Appraisals of Sleeping More Than Usual, Positive Appraisals of Sleeping Less Than Usual, and Negative Appraisals of Sleeping Less Than Usual. In addition, the PANSAM has demonstrated acceptable scale reliability: Cronbach’s $\alpha = .91$ (Pearson, Mansell, et al., 2019) and Cronbach’s $\alpha = .94$ (Pearson, Parker, et al., 2019b). In this study, participants rated the 33-statements (e.g. “The less I sleep, the more likely it is I get everything done”) on a visual analogue scale from 0 (I don’t believe this at all) to 100 (I believe this completely).

### 7.3.3.2. Internal States Scale (ISS) (Bauer et al., 1991)

The ISS is a 16-item self-report measure designed to assess recent (24 hour) manic and depressive symptoms. The ISS has four empirically derived subscales with acceptable scale reliability (Cronbach’s $\alpha$): Activation ($\alpha = .92$), Well-being ($\alpha = .84$), Perceived Conflict ($\alpha = .87$), and Depression Index ($\alpha = .81$). These have been shown to discriminate mood states in BD (Bauer et al., 1991; Bauer et al., 2000; Cooke et al., 1996). Participants completed questions 1-15 using a visual analogue scale from 0 (not at all / rarely) to 100 (very much so / much of the time). Question 16 asked the participant to rate how they feel, using a visual analogue scale from -50 (depressed / down) to 0 (normal) to +50 (manic / high).

### 7.3.3.3. Hypomanic Personality Scale (HYP) (Eckblad & Chapman, 1986)

The HYP is a 48-true/false-item, non-clinical measure that assesses for personality style associated with hypomanic episodes. Items include “I often have moods where I feel so energetic and optimistic that I feel I could outperform almost anyone at anything.” Scores range from 0-48, with a score of 31 or higher a predictor of BD symptoms. The HYP has acceptable scale reliability (Cronbach’s $\alpha = .87$) and good test-retest reliability after 15 weeks ($r = .81$).

### 7.3.3.4. Patient Health Questionnaire – 9 (PHQ-9) (Kroenke et al., 2001)

The PHQ-9 is a 9-item self-report measure of depression severity with acceptable scale reliability (Cronbach’s $\alpha$ 0.89 and $\alpha$ 0.86 in two separate samples) and test-retest reliability (correlation = 0.84; mean scores 5.08 vs. 5.03). Participants were asked how often they have been bothered by the 9-items over the past 2 weeks, with four options ranging from 0
(not at all) to 3 (nearly every day). Total scores indicate minimal, mild, moderate, moderately severe, and severe levels of depression severity.

7.3.3.5. **Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989)**

Pittsburgh Sleep Quality Index (PSQI) is a 19-item self-report measure assessing sleep quality during the previous month. It is comprised of seven components measuring subjective sleep quality, latency, duration, efficiency, disturbances, use of sleeping medications, and daytime functioning. These components are then totalled for a global PSQI score that has a range of 0-21, with higher scores indicating worse sleep quality. Scale reliability is acceptable (Cronbach’s α = 0.83).

7.3.3.6. **Hypomanic Attitudes & Positive Predictions Inventory (HAPPI) (Mansell, 2006)**

The HAPPI is a 61-item self-report measure assessing for the multiple, extreme, and personalised appraisals about high and low mood. Participants rate the statements using a visual analogue scale from 0 (I don’t believe this at all) to 100 (I believe this completely). The HAPPI has a 6-factor structure with acceptable scale reliability: Social Self-Criticism (Cronbach’s α = 0.90), Increasing Activation to Avoid Failure (Cronbach’s α = 0.83), Success Activation and Triumph Over Fear (Cronbach’s α = 0.86), Loss of Control (Cronbach’s α = 0.87), Grandiose Appraisals of Ideation (Cronbach’s α = 0.83) and Regaining Autonomy (Cronbach’s α = 0.80) (Dodd, Mansell, et al., 2011b).

7.3.3.7. **Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS) (Morin et al., 1993)**

The DBAS is a 28-item scale that assesses for a range of beliefs, attitudes, expectations, and attributions about sleep and insomnia. Five conceptually derived themes comprise the scale: Consequences of Insomnia, Control and Predictability of Sleep, Sleep Requirement Expectations, Causal Attributions of Insomnia, and Sleep-Promoting Practices. Participants rated the statements (e.g. “I need 8 hours of sleep to feel refreshed and function well during the day”) on a visual analogue scale from 0 (Strongly disagree) to 100 (Strongly agree). Item 23 is reverse scored, and higher scores indicate a dysfunctional belief. The DBAS scale has acceptable scale reliability with both good (Cronbach’s α = 0.80) and poor (Cronbach’s α = 0.81) adult sleepers.

7.3.4. **Daily Diary Design and Measures**

7.3.4.1. **Actigraphy**
To provide an objective estimate of TST, participants were instructed to wear a MotionWatch 8 actigraph watch (CamNtech Ltd: Cambridge, UK) continuously for 14 consecutive day and nights, and to remove it only when bathing. The watch is a compact and lightweight device worn on the nondominant wrist. Actigraphs were measured in 60-s epochs, which the digital accelerometer in the device differentiates between probable wake and sleep states based on the participant’s movements. The researcher (LP) highlighted the ‘time in bed’ window for each night to obtain the TST parameter. This was determined first by a marker on the actigraphy data that indicated when participants had pressed the event marker on the watch, which they were instructed to do when they got into bed at night and out of bed in the morning. When this was missing, these times were taken from the sleep diary as recommended by Kushida et al. (2001), in order to limit data loss (Boudebesse et al., 2013).

**7.3.4.2. Consensus Sleep Diary**

To provide a subjective estimate of TST, participants were instructed to complete a daily sleep diary. The Consensus Sleep Diary (Carney et al., 2012) was developed by a team of insomnia experts and is currently the standardised diary in use for clinical and research purposes. Questions on the diary include “what time did you get into bed”, “how long did it take you to fall asleep”, what time was your final awakening” and “how would you rate the quality of your sleep” with choices ranging from “very poor” to “very good.” The participant was instructed to complete the diary each morning close to the time they had woken up.

**7.3.5. Procedure**

Participants who contacted the researcher to express an interest in taking part were sent the participant information sheet to review at least 24-hours before attending an appointment to begin the study where written informed consent was obtained. At the first appointment, participants completed the self-report measures and were also shown instructions on how to complete the daily sleep diary and how to use the actigraphy watch. A second appointment was made for 14-days later at which the participants returned the sleep diary and actigraphy watch and re-completed the self-report measures for reliability testing. All participants were given a debrief document that signposted towards support services should they have any concerns about their mood or sleep.

**7.4. Results**
7.4.1. Descriptive Statistics and Preliminary Analysis

All data was analysed using SPSS for Windows (Version 22). Missing data were replaced with a pro-rated value. For the actigraphy, no more than 4-data points were missing (at least 71% of two-week data collection) for any participant included in the analysis. Three participants were excluded from the diary analysis due to missing more than 4-data points, leaving n = 62 for diary analysis (94% of original dataset). See Table 15 for descriptive statistics of all measure variables collected at baseline and Table 16 for descriptive statistics for sleep data. Upon review of previous sleep research, the mean subjective TST was within the range of recorded good sleepers (7 -8 hours) (Morin, 1993), whereas the mean objective TST was less. The PANSAM demonstrated acceptable scale reliability at baseline (Cronbach’s α = .91) and at follow-up (Cronbach’s α = .94) and test re-test was acceptable (r = .86, p < .01).

Table 16. Study 5, Measure descriptive statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
<th>SD</th>
<th>Test Re-test reliability (r)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PANSAM</td>
<td>26.39</td>
<td>1.33</td>
<td>56.00</td>
<td>14.85</td>
<td>.86**</td>
</tr>
<tr>
<td>DBAS</td>
<td>36.73</td>
<td>4.82</td>
<td>74.79</td>
<td>14.07</td>
<td>.86**</td>
</tr>
<tr>
<td>HAPPI</td>
<td>21.97</td>
<td>.82</td>
<td>64.10</td>
<td>16.07</td>
<td>.92**</td>
</tr>
<tr>
<td>PHQ-9</td>
<td>6.02</td>
<td>0</td>
<td>19.0</td>
<td>5.04</td>
<td>.87**</td>
</tr>
<tr>
<td>HYP</td>
<td>14.88</td>
<td>0</td>
<td>36</td>
<td>9.61</td>
<td>.81**</td>
</tr>
<tr>
<td>PSQI</td>
<td>6.84</td>
<td>0</td>
<td>18</td>
<td>4.05</td>
<td>.76**</td>
</tr>
<tr>
<td>Sleep Distress</td>
<td>30.73</td>
<td>0</td>
<td>85</td>
<td>27.94</td>
<td>.77**</td>
</tr>
<tr>
<td>ISS Conflict</td>
<td>75.16</td>
<td>0</td>
<td>280</td>
<td>71.77</td>
<td>N/A</td>
</tr>
<tr>
<td>ISS Wellbeing</td>
<td>157.42</td>
<td>30</td>
<td>270</td>
<td>57.69</td>
<td>N/A</td>
</tr>
<tr>
<td>ISS Activation</td>
<td>101.72</td>
<td>0</td>
<td>380</td>
<td>99.12</td>
<td>N/A</td>
</tr>
<tr>
<td>ISS Depression</td>
<td>30.70</td>
<td>0</td>
<td>160</td>
<td>38.96</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Note. PANSAM = Positive and Negative Sleep Appraisal Measure; DBAS = Dysfunctional Beliefs and Attitudes about Sleep Scale; HAPPI = Hypomanic Attitudes and Positive Predictions Inventory; PHQ-9 = Patient Health Questionnaire-9; HYP = Hypomanic Personality Scale; PSQI = Pittsburgh Sleep Quality Index; ISS = Internal States Scale

** = Correlation is significant at the .01 level (2-tailed)
7.4.2. Does the PANSAM predict TST subjective and objective variability?

Our key hypothesis was the PANSAM would predict subjective and objective TST variability. A review of the Shapiro-Wilk test, skew, kurtosis, histogram and q-plot indicated the DV’s were strongly, positively skewed and thus a Log transformation of each was conducted and used for all analyses. Positive linearity with both DVs was established by visual inspection of a scatterplot (See Charts 1 and 2). A Pearson’s correlation showed a small, positive correlation ($r = .241$, $p > .05$) for subjective TST variability. A significant medium strength, positive correlation ($r = .338$, $p < .01$) was shown for objective TST variability.

Table 17. Study 5, Sleep data descriptive statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Data Type</th>
<th>Mean (SD)</th>
<th>Min</th>
<th>Max</th>
<th>Standard Deviation (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TST</td>
<td>Subjective (n = 62)</td>
<td>446.4 min (50.8)</td>
<td>315.0 min</td>
<td>546.0 min</td>
<td>71.8 min (26.0)</td>
</tr>
<tr>
<td></td>
<td>Objective (n = 64)</td>
<td>387.8 min (41.0)</td>
<td>263.9 min</td>
<td>483.1 min</td>
<td>63.1 min (23.2)</td>
</tr>
</tbody>
</table>

Note. TST = Total Sleep Time
420 min = 7 hours
Figure 9. Study 5, Sleep diary relationship with PANSAM

![Chart 1 Sleep Diary Relationship with PANSAM](image)

Figure 10. Study 5, Sleep actigraphy relationship with PANSAM

![Chart 2 Sleep Actigraphy Relationship with PANSAM](image)
7.4.3. What is the incremental validity of the PANSAM with TST subjective and objective variability?

In order to test the incremental validity of the PANSAM with TST subjective and objective variability, two separate hierarchical regressions were conducted. Pearson’s correlations were first conducted to test for associations between all baseline measures and subjective and objective TST variability (See Table 17) for inclusion as a predictor variable (included in full correlation matrix in Appendix 23). Additional correlations have been included in Table 17 for mean subjective and objective TST, although these variables were not included in the hierarchical regressions. An independent samples t-test confirmed there were no differences between males and females and age was not significantly correlated with the DV’s, hence gender and age were not included in the hierarchical regressions.

Table 18. Study 5, Correlations between baseline self-report measures & outcome measures

<table>
<thead>
<tr>
<th>Baseline Measure</th>
<th>Subjective TST Variability (n = 62)</th>
<th>Subjective TST Mean (n = 62)</th>
<th>Objective TST Variability (n = 64)</th>
<th>Objective TST Mean (n = 64)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PANSAM</td>
<td>.243</td>
<td>-.089</td>
<td>.338**</td>
<td>.070</td>
</tr>
<tr>
<td>PANSAM (+ / ↓)</td>
<td>.271*</td>
<td>-.049</td>
<td>.382**</td>
<td>-.015</td>
</tr>
<tr>
<td>PANSAM (- / ↓)</td>
<td>.148</td>
<td>-.035</td>
<td>.108</td>
<td>.246</td>
</tr>
<tr>
<td>PANSAM (+ / ↑)</td>
<td>.104</td>
<td>-.077</td>
<td>.253*</td>
<td>-.003</td>
</tr>
<tr>
<td>PANSAM (- / ↑)</td>
<td>.155</td>
<td>-.055</td>
<td>.340**</td>
<td>-.081</td>
</tr>
<tr>
<td>DBAS</td>
<td>.280*</td>
<td>-.201</td>
<td>.208</td>
<td>.168</td>
</tr>
<tr>
<td>HAPPI</td>
<td>.322*</td>
<td>-.061</td>
<td>.354**</td>
<td>-.007</td>
</tr>
<tr>
<td>PHQ-9</td>
<td>.138</td>
<td>-.222</td>
<td>.145</td>
<td>-.038</td>
</tr>
<tr>
<td>HYP</td>
<td>.251*</td>
<td>.064</td>
<td>.329**</td>
<td>-.102</td>
</tr>
<tr>
<td>PSQI</td>
<td>.227</td>
<td>-.454**</td>
<td>.204</td>
<td>-.074</td>
</tr>
<tr>
<td>Sleep Distress</td>
<td>.225</td>
<td>-.291*</td>
<td>.172</td>
<td>-.106</td>
</tr>
<tr>
<td>ISS Conflict</td>
<td>.040</td>
<td>-.233</td>
<td>.078</td>
<td>-.236</td>
</tr>
<tr>
<td>ISS Wellbeing</td>
<td>.194</td>
<td>.199</td>
<td>.139</td>
<td>-.035</td>
</tr>
<tr>
<td>ISS Activation</td>
<td>.209</td>
<td>.012</td>
<td>.232</td>
<td>.086</td>
</tr>
<tr>
<td>ISS Depression</td>
<td>.198</td>
<td>-.170</td>
<td>.067</td>
<td>-.311*</td>
</tr>
</tbody>
</table>

Note. PANSAM = Positive and Negative Sleep Appraisal Measure; PANSAM (+ / ↓) = Positive Appraisals of Sleeping Less Than Usual; PANSAM (- / ↓) = Negative Appraisals of Sleeping Less Than Usual; PANSAM (+ / ↑) = Positive Appraisals of Sleeping More Than Usual; PANSAM (- / ↑) = Negative Appraisals of Sleeping More Than Usual; DBAS = Dysfunctional Beliefs and Attitudes about Sleep Scale; HAPPI = Hypomanic Attitudes and Positive Predictions Inventory; PHQ=9 = Patient Health Questionnaire-9; HYP = Hypomanic Personality Scale; PSQI = Pittsburgh Sleep Quality Index; ISS = Internal States Scale

** = Correlation is significant at the .01 level (2-tailed)
* = Correlation is significant at the .05 level (2-tailed)
HYP was controlled for in the 1st step of the model due to the outcome of the Pearson’s correlations and to control for a trait measure of bipolar tendencies. The DBAS was entered in the 2nd step of the regression model to control for an established measure of sleep cognitions. In order to see how much variance the PANSAM score independently contributed to the model, this variable was entered in the 3rd and final step. Although the HAPPI was shown to have a significant correlation with both subjective and objective variability, it was highly correlated with the PANSAM (r = .816, p < .01) and so was not included in the regression model due to violating the assumption of multicollinearity (Field, 2009). Similarly, the PANSAM subscales were also not included.

For each regression, there was independence of residuals as assessed by a Durbin-Watson statistic (2.005 for subjective DV and 1.574 for objective DV). Review of partial regression plots confirmed linearity and scatterplots showed that the assumption of homoscedasticity was satisfied. Tolerance statistics were all greater than .2, and Variance Inflation Factors (VIF) were all well below 10.

Table 19 shows the final β values and their significance level for the final step of the regression model for both subjective and objective sleep variability.

Table 19. Study 5, Regression analyses for subjective & objective variability

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>TST Subjective Variability (n = 62)</th>
<th>TST Objective Variability (n = 64)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Measure</td>
<td>B</td>
<td>β</td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HYP</td>
<td>.386</td>
<td>.252*</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HYP</td>
<td>.264</td>
<td>.172</td>
</tr>
<tr>
<td>DBAS</td>
<td>.005</td>
<td>.217</td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HYP</td>
<td>.246</td>
<td>.160</td>
</tr>
<tr>
<td>DBAS</td>
<td>.004</td>
<td>.196</td>
</tr>
<tr>
<td>PANSAM</td>
<td>.001</td>
<td>.040</td>
</tr>
</tbody>
</table>

Note. HYP = Hypomanic Personality Scale; DBAS = Dysfunctional Beliefs and Attitudes about Sleep Scale; PANSAM = Positive and Negative Sleep Appraisal Measure
Subjective R² = .060* for Step 1; ∆R² = .037 (R² = .097) for Step 2; ∆R² = .002 (R² = .099) for Step 3.
Objective R² = .019** for Step 1; ∆R² = .010 (R² = .119) for Step 2; ∆R² = .039 (R² = .159) for Step 3.

* = Correlation is significant at the .05 level
** = Correlation is significant at the .01 level
For both subjective and objective TST variability, the PANSAM did not significantly add to the variance and none of the predictors were significant in the final step. HYP was the only significant predictor in the second step for objective TST variability.

7.5. Discussion

The primary hypothesis for this study was the PANSAM would predict both subjective and objective TST variability. Pearson’s correlations showed that the PANSAM mean score (representing conflict) significantly correlated with objective but not with subjective TST variability. Looking more closely at the individual subscales of the PANSAM, the Positive Appraisals of Sleeping Less than Usual, Positive Appraisals of Sleeping More than Usual, and Negative Appraisals of Sleeping More than Usual were each correlated with objective TST variability. These subscales represent appraisals relevant for reduced need for sleep and hypersomnia, indicating that it may be these opposing sleep disturbances that are in conflict and reflected objectively. The PANSAM subscale that was not significantly correlated with objective TST variability is Negative Appraisals of Sleeping Less than Usual, which represents insomnia-relevant appraisals. A key experience of insomnia is the misperception of actual sleep time (overestimating time to fall asleep and underestimating sleep duration) (Rezaie, Fobian, McCall, & Khazaie, 2018) and patients often underestimate their TST relative to objective measures of sleep (Harvey & Tang, 2012) that include actigraphy (Tang & Harvey, 2004; Wicklow & Espie, 2000). Although this subscale was not significantly correlated with subjective TST variability, the DBAS was. This could indicate that insomnia-relevant appraisals are more likely to be reflected by subjective reports of TST variability, which sleep diaries are likely to capture (Buysse et al., 2006).

These findings contribute to the overall psychometric validation of this new measure, providing additional evidence the PANSAM correlates with all included sleep and mood variables (as evidenced in Appendix 23). We also tested the incremental validity of the PANSAM on subjective and objective TST variability, although this was not upheld with the addition of the HYP and DBAS included in a regression analysis. One particularly important observation from this data is that hypomanic vulnerability seems to be key to sleep variability. The HYP, HAPPI, and the PANSAM subscale Positive Appraisals of Sleeping Less than Usual were each correlated with subjective and objective TST variability and these measures and subscale represent those who are susceptible to elevated mood, or a hypomanic endophenotype. Although this endophenotype has been associated with the development of BD (Kwapil et al., 2000), Mansell (2016) states the argument that
these experiences are widely reported by nonclinical samples (Jones, Mansell, et al., 2006; Udachina & Mansell, 2007) and fulfil a positive, functional role (Seal et al., 2008). For example, a university student might experience elevated mood and feel more sociable, thus choosing to stay out late over sleep. Or the same university student might want to catch up on sleep over the weekend and choose to have long lie-ins for a couple of days. This pattern could be indicative of someone who displays a hypomanic endophenotype and experiences sleep variability without feeling distressed about their routine or experiencing any significant low mood periods. Mansell (2016) highlights his work with colleagues (Mansell et al., 2007; Searson, Mansell, Lowens, & Tai, 2012) that suggest the clinical difference between this university student and someone who has BD is negative thinking about the high moods. In particular, when negative thinking about high moods is combined with positive thinking about high moods the rate of those who have BD is much higher (Kelly et al., 2011), suggesting that people with BD are in conflict over internal states. This pattern of thinking can be considered a transdiagnostic process that contributes to and maintains disorders (Harvey et al., 2004). The PANSAM was developed to assess for this conflict in sleep appraisals and is based on a cognitive model that proposes to highlight these appraisals along a continuum from non-clinical to clinical experiences. Since HYP, HAPPI, and the Positive Appraisals of Sleeping Less than Usual subscale are each associated with the different sleep variabilities calculated in this analogue study, it highlights that sleep variability may be part of the hypomanic endophenotype. Although we would have expected the overall PANSAM score to be associated with the subjective TST variability also, it was associated with the objective TST variability which represented a shorter TST than the subjective. Shorter duration sleep, or reduced need for sleep, is also a characteristic of the hypomanic endophenotype.

7.5.1. Strengths & Limitations

A strength of this study was the collection of both subjective and objective measures of sleep across a 14-day period in order to best capture variability. To reliably measure total sleep time, it is recommended to obtain 7-days or more of actigraphy (Aili, Astrom-Paulsson, Stoetzer, Svartengren, & Hillert, 2017) which this study achieved and extended. An additional strength is the relative lack of missing data considering this study required participant’s daily participation for 14-consecutive days. Although there were 3 participants excluded from the subjective TST analysis due to missing more than 4-data points on the sleep diary and 1 participant excluded from the objective TST due to a fault with the actigraphy watch, there were no missing data points on any of the self-report
measures since these were completed at appointments with the researcher who checked for missing data.

A limitation of this study is the sample recruited. Although a predominantly student sample were recruited at the university, some participants who took part were not students. For this reason, we must be cautious with our assumptions to the general population. In addition, since this was not a clinical study we did not accurately assess for those who might meet clinical criteria for mood and sleep disorders, which could represent important confounds. We theorise that the PANSAM should be able to assess for extreme appraisals that map across the sleep continuum from clinical and non-clinical sleep disturbances, since it is based on a cognitive model that proposes this. The results of this study indicate the PANSAM was not significantly correlated with subjective TST variability in this group.

Looking more closely at our sample, the overall mean score for the HYP (14.88) was under the cut-off score of 31 for predicting BD symptoms. However, our sample did meet the threshold for mild depression on the PHQ-9 and a cut-off score of > 5 representing poor quality sleep (Buysse et al., 1989). Since the PANSAM has been shown to distinguish those along the clinical BD spectrum and those with unipolar depression from healthy controls, it is recommended this study methodology is conducted with clinical groups who meet criteria for fluctuating sleep disturbances in order to ascertain the strength of the association with clinical sleep subjective and objective variability. This will help to further inform the validity of the PANSAM and potential clinical use. A final limitation of this study is our methodology only captured sleep duration variability as an individual different within a group, and we did not capture the change in variability that might occur after appraisals are endorsed more strongly. Future research should be designed to test if the PANSAM predicts an increase in variability over time.

The results of the current study contribute additional psychometric validation of the PANSAM showing good test re-test and internal scale reliability. Construct validity was also upheld with associated measures. This study set out to begin preliminary investigation of the proposed theory that sleep variability is driven by extreme, conflicting appraisals represented by the PANSAM. Although there may be limitations with the sample recruited, the hypomanic endophenotype has been highlighted as important. Future investigations should be sought with clinical groups who may express more sleep variability.
8. General Discussion

8.1. Overview

This thesis aimed to gain a better understanding about the role that positive and negative sleep appraisals play in the maintenance of a range of sleep duration disturbances. With a significant focus on insomnia in the research and clinical fields, attention should be turned to the cognitive processes underpinning the wider range of sleep duration disturbances that people experience. This is in the aim that sleep interventions, such as a transdiagnostic CBT sleep package, will be able to deliver an evidence-based cognitive approach. In order to answer this overarching research question, the research team were interested in exploring the application of sleep to the ICM. The ICM has been widely evidenced in the field of BD for fluctuating mood (Kelly et al., 2017), and the research team were interested in learning whether the same mechanisms play a key role in the maintenance of fluctuating sleep disturbances that present across the mood spectrum.

In order to address this overarching research question, this thesis had three specific research aims: 1) develop a sleep cognition measure (PANSAM) that assesses for positive and negative appraisals for excessively short or long sleep durations; 2) establish initial validity and reliability for the PANSAM; 3) use the PANSAM to test the proposed Integrative Cognitive Sleep Model (ICSM). Further aims and hypotheses related to each of the three specific research aims were developed and researched in the studies that comprise this thesis. In this chapter, an overview of the findings obtained with respect to these aims and hypotheses will first be provided in the following sections. Interpretations, strengths, and limitations will be discussed throughout. Following this, overall conclusions and implications for future research will be discussed.

8.2. Research Aim 1: Develop a sleep cognition measure that assesses for positive and negative appraisals for excessively short or long sleep durations

8.2.1. Aim 1.1 / Study 1: Conduct a scoping review to discover the range of self-report sleep cognition measures discussed in the literature for the sleep disturbances insomnia, hypersomnia, and reduced need for sleep.

In order to explore sleep appraisals and begin testing the proposed ICSM, a measurement tool was required. The research team defined the construct for this necessary measure as
positive and negative appraisals of both sleeping more and less than usual. This construct definition is in line with the theory underpinning the ICM and encompasses the range of sleep disturbances experienced by those with BD that are defined by sleep duration. With the construct defined, it was important that the literature be reviewed to ensure there was not already an available measure. An initial review of the literature at the outset of this research programme indicated there were no appropriate sleep cognition measures that were intended for the range of sleep disturbances experienced by those with BD. In order to confirm this, a scoping review of the literature was conducted (Study 1). This scoping review set out to discover the range of self-report sleep cognition measures discussed in the literature for the sleep disturbances insomnia, hypersomnia, and reduced need for sleep. Forty-one measures were accepted and the results evidenced that the majority of the measures were intended for an insomnia population or for poor sleep suggestive of insomnia symptoms in the general population. These measures had been developed based on theoretical conceptualisations of insomnia that had been researched for several decades. The results also highlighted that there were no measures developed specifically for hypersomnia or reduced need for sleep. An item level analysis of the accepted measures was then undertaken to identify cognition statements that might be relevant for these additional sleep duration disturbances. The domains in which relevant items were identified were sleep hygiene practices, arousal, beliefs and attitudes, and control and self-efficacy. Despite potential statements that could be relevant for hypersomnia or reduced need for sleep, there was no measure that was theoretically developed to measure these intended sleep disturbances.

8.2.2. Aim 1.2 / Study 2: Conduct a Delphi method study in order to explore and identify expert consensus on positive and negative sleep appraisals in the context of low and high mood states.

With no available measure relevant for use in testing the proposed ICSM (as confirmed by the scoping review), the PANSAM was developed. The research team first set out to generate statements that would assess for the defined construct. Boateng et al. (2018) recommends it is best practice to combine both deductive and inductive methods for identifying measure items. Deductive methods include reviewing the literature and examining existing measures that could be relevant. Inductive methods involve the development of statements from the responses of individuals. A strength of the PANSAM development is the incorporation of both these methods in generating statements. First, the research team developed 31 statements that mapped across the defined construct. These
included statements such as “I sleep more to keep myself safe from my extreme moods” (positive appraisal of sleeping more than usual) and “I worry something bad will happen if I sleep too long” (negative appraisal of sleeping more than usual). These statements were developed based on the research team’s own clinical and research experience, as well as reviewing select measures from the literature (mainly the DBAS). In addition, the lead author (LP) had reviewed an online BD forum (www.psychforums.com). This is a community site where those with mood difficulties can share experiences. A search was conducted for postings related to sleep difficulties, and this helped to inform additional statements based on anecdotal evidence of how people interpret their sleep. A Delphi method approach was then conducted for Study 2 in order to achieve a robust development process for the statements to be included on the measure.

In the first round of the Delphi study, researchers and clinicians who had been identified in the literature as making a significant contribution to BD research were invited to take part. The participants were briefed about the ICM and the mechanism of extreme and conflicting appraisals of mood playing a key role in the maintenance of mood fluctuations. It was then explained the purpose of the Delphi was to generate appraisal statements that represent this same theoretical approach to sleep duration disturbances experienced by those with BD. The participants were instructed to consider what positive and negative appraisals for sleeping more or less than usual were relevant for those with BD. The participants reviewed the statements the research team had developed, providing comments on wording and consensus ratings about how important the item was. An additional option was for the participants to also generate statements or themes that should be included on the measure. The research team then reviewed the outcome of this first round of the Delphi and amended and added statements based on the feedback. This resulted in 38 statements that were then put out for two consensus rounds with a wider participant group invited. The outcome of these final two rounds was high consensus achieved for 19 statements that mapped nearly equally across the four domains of the measure, representing the range of positive and negative appraisals for both sleeping more and less than usual. This confirmed that researchers and clinicians in the field of BD agreed conflicting positive and negative sleep duration appraisals, represented by these statements, were important in the context of those with mood difficulties.

A limitation of the PANSAM development is the lack of service user input at the item generation stage. Although an online forum had been reviewed for themes in sleep interpretation by those with self-reported mood difficulties, this is not comparable to a more robust method such as qualitative interviews. Recent COSMIN guidelines for rating...
the quality (or content validity) of patient reported outcomes measure’s (PROMS) recommend that qualitative work should be conducted with the target population in the development stage (Terwee et al., 2018). Although this was not conducted, additional steps for assessing content validity were examined, described below in Research Aim 2.

8.3. Research Aim 2: Establish initial validity and reliability for the PANSAM

Newly developed measures need to be tested for validity and reliability in order to ensure they are appropriate for use. For this reason, upon generation of the PANSAM statements the second aim of this thesis was to establish initial validity and reliability for this new measure. Validity is the extent to which an instrument measures what it was intended to measure while reliability is the measure of consistency of the instrument (Field, 2009; Tsang et al., 2017). There are different aspects of validity and reliability that need to be tested. This thesis established initial content and construct validity and assessed for internal and test re-test reliability, generally following guidelines set out by Tsang et al. (2017). In order to establish initial validity and reliability for the PANSAM, the following aims and hypotheses were addressed in individual studies and will be discussed below in the relevant sections.

8.3.1. Content Validity

In more recent guidelines for measure development set out by Boateng et al. (2018), it is advised that a new measure be evaluated by both experts and the target population for content validity. This is to check that the statements represent the domain of interest. Boateng et al. (2018) recommend the Delphi method approach for determining expert evaluation since it enables consensus agreement. As discussed above, the PANSAM statements were generated in a Delphi method study (Study 2). However, Boateng et al. (2018) go on to explain that the experts used in evaluating content validity should not be the same group of people who developed the statements. This guideline was partially followed in Study 2. A small group of identified experts in the literature were invited to take part in Round 1 for providing feedback on the statements and developing new ones. The remaining two rounds were the consensus rounds, and this included a wider group of professionals with experience of working with those who have BD. Although the consensus rounds included additional participants from those who had taken part in the Round 1, there were still some experts from Round 1 who likely took part in Rounds 2 and 3. The study was kept anonymous with non-personally identifiable information collected
from all of the participants. For this reason, the research team are unable to accurately
know who took part in Round 1 and then in the subsequent rounds also. Despite this,
expert evaluation was conducted on the PANSAM using a recommended approach.

Boateng et al. (2018) explain that evaluation of a measure by the target population can be
done to determine face validity. Face validity is the degree to which respondents an
assessment is aimed for agree it is appropriate and effective for the targeted construct
(Haynes, Richard, & Kubany, 1995). Target population evaluation can be achieved with
cognitive interviews or focus group discussions. Boateng et al. (2018) highlight that
cognitive interviews are the most recommended approach, as this technique allows the
target population participants to discuss in detail each item and the relevance to their
experience. This enables items to be modified, clarified, and amended. For the purposes of
this thesis, a focus group approach was agreed instead since the PANSAM was already in
use in different studies. The focus group aimed to assess face validity of the PANSAM and
to compare it to the more commonly used DBAS measure that has been incorporated in
BD research previously (Harvey et al., 2005; Ng et al., 2016). Participants who had taken
part in the BART research trial were invited to take part in a focus group session at the
University of Manchester. Unfortunately there was poor turnout to the planned session (n =
2), so it was agreed LP would continue to meet individually with the remaining
participants (n = 6) interested in taking part. Participants each completed the PANSAM
and then a feedback form with questions that had been developed by the research team
(Please see Appendix 1 for the PANSAM feedback form responses). Overall, the face
validity for the PANSAM was considered good. All participants agreed the PANSAM
appraisal statements were important in relation to their mood and the items related well to
both their high and low mood.

8.3.2. Construct validity

In order to determine construct validity, three approaches were taken. As explained in
Chapter 2, these were a reduction analysis, convergent validity with relevant variables, and
discriminant validity.

8.3.2.1. Reduction Analysis

8.3.2.1.1. Aim 2.1 / Study 3: Explore the factor structure of the sleep cognition
measure

Factor analysis is the method in which items are reduced to include only those that are
“parsimonious, functional, and internally consistent” (Boateng et al., 2018, p. 9), whilst
also determining the subscales within the measure (or what items cluster together in a meaningful way). In Study 3, a large university sample was recruited for a cross-sectional study. Exploratory factor analysis was performed using maximum likelihood extraction which is considered a “true” factor reduction analysis compared to the popularly used principal components analysis (Costello & Osborne, 2005). The results indicated that the original measure of 33-items could be reduced to 22-items, with a 4-factor structure matching the intended theoretical subscales. Analyses using the subscales of the PANSAM in subsequent studies used the 22-items that were a result of this factor analysis. Hence, this validation test also contributed to the ongoing development of the measure (Research Aim 1).

8.3.2.2. Convergent Validity

8.3.2.2.1. Aim 2.2 / Study 3: Review the construct validity of the sleep cognition measure with validated measures representing BD personality, mood, sleep, and cognitions relevant to both mood and sleep

Construct validity can also be evaluated by estimating the PANSAM’s association with other validated measures, referred to as convergent validity. The hypothesis for Study 3 (Hypothesis 2.2.1) was that the PANSAM was expected to be positively associated with high and low mood tendencies, poor sleep quality, and cognitions that maintain both sleep disruption and shifts in mood. This hypothesis was supported, with Pearson’s product-moment correlation coefficients showing significant medium to high positive associations with cognition variables (DBAS and HAPPI), sleep variables (PSQI, Sleep Distress), and mood variables (PHQ-I, HYP, and ISS subscales for conflict, activation, and depression) (See Appendix for correlation matrix). These correlations were upheld with an additional university sample in Study 5 and with the clinical and non-clinical sample in Study 4.

8.3.2.3. Discriminant Validity

8.3.2.3.1. Aim 2.3 / Study 4: Test the sleep cognition measure in line with the ICM by comparing individuals who experience both elevated and depressed mood states (a BD spectrum group) with two control groups (UPD and non-clinical groups).

Discriminant validity examines if the PANSAM is able to differentiate between expected groups. This was tested in Study 4 which recruited three separate groups of participants – those who met criteria for a BD spectrum diagnosis, those who met criteria for unipolar depression, and a non-clinical control group. The hypothesis for Study 4 (Hypothesis 2.3.1) was the BD spectrum group would score significantly higher than the two control groups.
on the overall PANSAM mean, due to their increased vulnerability to the wide range of sleep disturbances. This was based on previous work that had shown the HAPPI discriminated those with BD (past mania) from both a unipolar depression group and non-clinical group (Mansell et al., 2011). The results of Study 4 only partially supported this hypothesis since the PANSAM discriminated both the clinical groups from the non-clinical group. However, discrimination between the BD and unipolar depression group was not shown.

8.3.3. Internal Reliability

In order to assess an instruments internal consistency, there are different reliability statistics that can be used. The most common approach is reporting Cronbach‟s alpha (α), but some additional statistical approaches include Raykov‟s rho, ordinal alpha, and Revelle’s beta (Boateng et al., 2018). For the purposes of this thesis, and to maintain consistency with the published literature, the Cronbach’s alpha for the PANSAM was analysed in Study 3 (Cronbach’s α = .91), Study 4 (Cronbach’s α = .94) and Study 5 (Cronbach’s α = .91). A coefficient score of .70 or more is considered an acceptable threshold for reliability, and these scores exceed this threshold highlighting good internal consistency. In addition, Cronbach’s α was reported for the individual subscales in Study 3 and these were all found to be above an acceptable level.

8.3.4. Test-Retest Reliability

The test-retest reliability check is to assess the degree to which participants’ performance is repeatable, or how much the scores vary across time (Field, 2009). Test-retest can be assessed by the intra-class correlation coefficient or the Pearson product-moment correlation. In both cases, a higher correlation indicates higher test-retest reliability. For the purposes of this study, a reliability check was conducted in Study 4 using the Pearson product-moment correlation. Following the two week period in which participants completed the sleep diary and actigraphy, the test-retest was r = .86. This is considered good test-retest reliability.

8.4. Research Aim 3: Use the PANSAM to test the proposed Integrative Cognitive Sleep Model (ICSM)

With the initial psychometric robustness of reliability and validity evidenced above, the PANSAM is appropriate for use in research investigating the proposed ICSM. Research Aim 2 does include some analyses that test the proposed ICSM. This includes the
convergent validity of the PANSAM with validated measures for mood, sleep, and mood and sleep cognitions which is initial evidence that positive and negative sleep appraisals are in line with the proposed ICSM. In addition, the discriminative and face validity tests evidence that the PANSAM is appropriate for use with clinical populations who experience mood difficulties. Analyses for Research Aim 3 were conducted to further examine the proposed ICSM with the PANSAM and these incorporated predictive and incremental statistical tests. These tests continue to assess the validity of PANSAM.

8.4.1. Aim 3.1 / Study 3: Conduct a hierarchical regression to explore the PANSAM’s predictive usefulness with a validated sleep quality measure over age, gender, BD tendency and the commonly used DBAS measure.

In Study 3 a hierarchical regression examined the predictive usefulness of the PANSAM subscales on poor sleep quality (as measured by the PSQI), entered following age, gender, BD personality traits (as measured by the HYP) and the DBAS subscales. The results showed the PANSAM subscale for Positive Appraisals of Sleeping More than Usual was significantly associated with the poor sleep scores. These appraisals include “I sleep more to escape from the real world,’’ which can represent sleep as a safety behaviour. This incremental validity highlights the importance of these appraisals with subjectively poor sleep. If a person has strong beliefs that sleeping more could protect them but is actually struggling with sleep, this could result in a state of internal conflict. According to the proposed ICSM, internal conflict could be playing a key role in sleep variability if it is combined with negative thinking about sleep duration (e.g. negative appraisals of sleeping more or less than usual) (Mansell, 2016).

8.4.2. Aim 3.2 / Study 5: Test if the PANSAM predicts a person’s sleep shifting from short to long duration sleep disturbances, night by night

Study 5 was developed as a more robust test of the proposed ICSM and hypothesised (Hypothesis 3.2.1) that higher PANSAM mean scores would predict higher rates of both subjective and objective TST variability. Subjective sleep was captured by a sleep diary while objective sleep was recorded via an actigraphy watch across a 14-day period. Pearson product-moment correlations showed the PANSAM mean score was significantly correlated with objective but not subjective TST variability. Upon a post-hoc inspection of the Pearson product-moment correlations of the individual subscales with objective TST variability, the appraisals representing reduced need for sleep (Positive Appraisals of Sleeping Less than Usual) and hypersomnia (Positive and Negative Appraisals of Sleeping
More than Usual) were statistically significant. This is an important finding in line with the proposed ICSM that the appraisals representing these two sleep duration disturbances may be in conflict and thus important mechanisms in driving objective sleep variability.

**8.4.3. Aim 3.3 / Study 5: Conduct a hierarchical regression to test the incremental validity of the PANSAM on subjective and objective validity, entered following associated variables.**

A secondary analysis in Study 5 was conducted to further examine the predictive usefulness of the PANSAM on both subjective and objective TST variability. Two hierarchical regressions in which the PANSAM mean score was entered following BD personality traits (as measured by the HYP) and the DBAS were conducted. Although the HAPPI was associated with both subjective and objective TST variability, it was not included in the regressions due to a high correlation with the PANSAM mean score. The results of both hierarchical regressions showed that the PANSAM did not significantly add to the variance and none of the predictors were significant in the final step. Despite the lack of incremental evidence for the PANSAM, an important finding was the significance of the HYP in step 1 and step 2 for objective variability. This coupled with the findings that the HYP, HAPPI, and the PANSAM’s Positive Appraisals for Sleeping Less than Usual subscale were each significantly correlated with objective and subjective TST variability highlights the importance of the hypomanic endophenotype on sleep variability. This strengthens the rationale for better understanding the cognitive mechanisms underpinning sleep duration variability and, in particular, shorter duration sleep which is characteristic of the hypomanic endophenotype.

**8.5. Unique Contributions of the PANSAM**

Throughout the research conducted in this thesis, it was important to compare the PANSAM with the validated DBAS measure. The reason for this is because the DBAS measure is the most commonly used sleep cognition measure. It is a useful instrument for evaluating change in sleep related beliefs and attitudes following CBT-I (Morin et al., 2007), and has been used in BD sleep related research (Harvey et al., 2005; Ng et al., 2016). Despite its widespread use, the DBAS is intended for insomnia only. For this reason, it was important to see if the PANSAM is an instrument that offers unique contributions to sleep cognition research. The Pilot Study compared ratings on feedback forms for both the PANSAM and the DBAS. The participants who took part were those who met criteria for Bipolar at Risk and had taken part in the Bipolar At Risk Trial.
(BART). Positive ratings on the feedback form questions for the PANSAM were higher overall compared to ratings given to the DBAS measure that the participants also evaluated (Please see Appendix 1 and 2 for both the PANSAM and DBAS participant feedback form responses). This highlights that the PANSAM may be more appropriate for use with this target population compared to the DBAS.

Study 4 compared the DBAS and the PANSAM across three groups: BD spectrum group, unipolar depression group, and a non-clinical group. The secondary hypothesis (2.3.2) predicted the overall DBAS mean would be significantly higher in both the BD spectrum group and the UPD group compared to the non-clinical group. This hypothesis was supported. Since the PANSAM also showed the same findings (rather than discriminating between all three groups), post-hoc Pearson product-moment correlations were conducted for the DBAS and PANSAM and the clinical mood (BDI and YMRS), sleep (PSQI and Sleep Distress) and anxiety (GAD-7) measures. The PANSAM mean and subscales were all significantly correlated with each of the clinical measures. The results were less consistent for the DBAS with only the “Consequences of Insomnia”, “Control and Predictability of Sleep”, and “Sleep-Promoting Practices” subscales significantly correlated. Although this finding shows the full DBAS is not statistically significant with each measure, both the DBAS and the PANSAM results highlight that sleep disruptive cognitions are important for those experiencing mood disturbances. This is particularly important when taking into account research that has shown that DBAS scores are higher for those with comorbid insomnia and mood disturbance compared to primary insomnia patients, even when controlling for depression symptoms (Carney et al., 2007).

Finally, Study 5 tested the DBAS and the PANSAM incrementally in two hierarchical regressions with subjective and objective TST variability as the dependent variables (Aim 3.3). Neither sleep cognition measure was shown to be a significant predictor of either TST variability. There were some differences between the DBAS and the PANSAM upon inspection of Pearson product-moment correlations coefficients however. The overall DBAS mean score was significantly correlated with subjective TST variability, whereas the PANSAM mean score was significantly correlated with objective TST variability.

8.6. Comparison with previous ICM research

Since the proposed ICSM and the development of the PANSAM are based on the ICM, it was important to incorporate the HAPPI in the research studies conducted in this thesis and compare findings with previous ICM research. The study that most directly achieved this comparison with previous findings was Study 4. A secondary hypothesis (2.3.3) for Study
predicted the overall mean for the HAPPI would be significantly higher for the BD group than both the unipolar depression group and the non-clinical group. This was based on previous work by Alatiq et al. (2010) and Mansell et al. (2011). This hypothesis was only partially supported in Study 4 since the HAPPI mean was significantly higher for both the BD spectrum group and the unipolar depression group compared with the non-clinical group. However, a statistically significant distinction was not made between the two clinical groups as has been shown in the previous research. There are two possible reasons for this. The first is that Study 4 did not recruit sufficiently for an accurate moderate to large effect size to be shown between the two clinical groups. In addition, the samples recruited in the previous ICM research have included only those with a history of mania or hypomania. In Study 4, the BD spectrum group included participants who met at-risk criteria as well as those with a history of mania and hypomania. Although the ICM is theoretically meant to explain the spectrum of non-clinical and clinical mood fluctuations, it may be the samples recruited for Study 4 were not clearly distinguishing those who experience activated mood states as had been expected. In addition to the wider participant criteria recruited for the BD spectrum group compared to previous research, the unipolar depression group scored higher on the activation subscale of the ISS than the BD spectrum group. This was an unexpected finding and highlights the unipolar depression group may be clinically closer to the BD spectrum group than anticipated.

8.7. Clinical Implications

Important clinical implications from the research conducted in this thesis have been identified. The first are the findings in the scoping review conducted in Study 1. The review identified 41 measures that represent sleep cognitions relevant for clinical or research purposes. The synthesis of information in the data chart reported in Study 1 can be helpful for clinicians and researchers who require a sleep cognition measure. The data chart clearly highlights what measures are intended for what purposes and what population group, along with information on the items and rating scale. This can be helpful information for easily identifying a relevant measure.

A second important clinical finding in this thesis is the validation from the clinicians and researchers in the field of BD who identified and confirmed consensus on the PANSAM statements. These statements represented both positive and negative appraisals of sleeping more and less than usual. This was an important outcome because although previous research in the literature has focused on cognitions relevant for insomnia, this study
highlighted that clinicians agreed cognitions relevant to the range of sleep duration disturbances are just as important.

Study 3 (Aim 3.1) highlighted important clinical implications about addressing the function of sleep in a treatment intervention. This is based on the finding that Positive Appraisals of Sleeping More than Usual was a significant predictor of poor sleep quality. These appraisals represent sleep as a safety behaviour (e.g. “I sleep more to escape from the real world”). This suggests that it would be important to know if a person endorsed these beliefs when in fact they are struggling with their sleep, so a clinician can address this in an intervention. An additional finding from Aim 3.1 was the DBAS subscale for Control and Predictability was also significantly associated with poor sleep quality. This DBAS subscale represents beliefs about losing control of sleep and the consequences of poor sleep. This complements previous findings that these items are more strongly endorsed by those with insomnia than normal sleepers (Carney & Edinger, 2006a; Morin et al., 1993) and strengthens the importance of addressing control and predictability of sleep in sleep interventions, particularly for insomnia.

Initial findings for transdiagnostic applicability are an important clinical implication highlighted in Study 4 (Aim 2.3). Both the PANSAM appraisals and DBAS beliefs were endorsed more by the clinical groups (BD spectrum group and unipolar depression group) compared to the non-clinical group. In addition, both sleep cognition measures showed significant positive correlations with mood, sleep and anxiety variables. These findings suggest the clinical groups are more susceptible to the dimension of General Psychopathology, or the “p” factor (Caspi et al., 2014). As this “p” factor increases it represents higher severity, duration, and comorbidity of disorders which leads to more disordered thoughts. These thoughts can then be targeted in CBT interventions. With the DBAS already in use for identifying insomnia related beliefs and treatment outcomes in CBT-I (Edinger et al., 2001; Morin et al., 2007), this study indicates the PANSAM is also a valid measure for use with clinical mood populations.

Finally, Study 5 (Aim 3.2) investigated the predictive ability of the PANSAM mean score on both subjective and objective TST variability. Although the PANSAM did not show a significant correlation with subjective TST variability, it did for objective TST variability. Upon further inspection of the individual PANSAM subscales, the appraisals representing reduced need for sleep (Positive Appraisals of Sleeping Less than Usual) and hypersomnia (Positive Appraisals of Sleeping and Less than Usual) were significantly, positively correlated with objective TST variability. This is an interesting finding and in line with the
proposed ICSM, highlights these sleep disturbances and related appraisals may be in conflict and driving objectively measured sleep variability. Regarding subjective TST variability, both the DBAS and the PANSAM subscale for reduced need for sleep (Positive Appraisals of Sleeping Less than Usual) showed significant correlations with subjective TST variability. This suggests that insomnia-relevant appraisals may be in conflict with reduced need for sleep appraisals and this sleep presentation may be more likely to be reflected by subjective reports of TST variability. It is interesting that for both objective and subjective TST variability, the PANSAM subscale for Positive Appraisals of Sleeping Less than Usual is significantly correlated. The same is for the HYP and HAPPI which are two additional measures representing the hypomanic endophenotype. Although hypersomnia and insomnia represent different sleep durations, it may be that sleep variability is driven by conflicting appraisals represented by the hypomanic endophenotype (e.g. reduced need for sleep appraisals).

8.8. Strengths & Limitations

An important strength of this thesis is the strong, theoretical basis of the ICM underpinning the proposed ICSM and the development of the PANSAM. According to the COSMIN methodology for assessing the content validity for patient reported outcome measures, as set out by Terwee et al. (2018), a rating of ‘very good’ for construct definition should be achieved for the PANSAM since the origin of the construct is clear. Despite the strength of the origin of the construct, the development of the measure without a more robust qualitative method (e.g. qualitative interviews with service users) does mean the PANSAM might not be rated as highly by the COSMIN methodology for the development stage. However, as explained in Aim 1.2, both inductive and deductive methods were incorporated in the PANSAM statement generation stage which is advised by Boateng et al. (2018). Additionally, the measure was subjected to a series of validity and reliability analyses to test psychometric robustness which is further evidence of content validity.

Research Aims 2 and 3 were mainly conducted in Studies 3, 4 and 5. A potential limitation of Studies 3 and 5 is the sample recruited. For both studies an analogue, convenience sample took part. Although the studies were advertised in a university space, it is not possible to explain the samples as students only since different members of the public were able to take part. Since these participants were not a clinical sample, the sleep disturbances and sleep variability experienced by those with BD may not have been captured as well. This could explain why some of the findings for the PANSAM have not been as expected. An additional limitation to Study 3 is the use of the PSQI as the dependent variable.
Although the PSQI is a validated instrument that reports global sleep quality, higher scores are more indicative of insomnia related sleep disturbances than hypersomnia (Buysse et al., 1989) or reduced need for sleep. For this reason, the results of this study may not have been able to adequately highlight the PANSAM’s predictive usefulness with the range of sleep duration disturbances and thus not capture conflicting appraisals such as Negative Appraisals for Sleeping More Than Usual. In order to more robustly explore the predictive usefulness of the PANSAM on sleep duration, a more representative measure of sleep variability was required. This was achieved in Study 5, where both subjective and objective measurements of sleep were captured across 14 days which is a strength of this study.

8.9. Future Research

The research conducted within this thesis has highlighted many new research questions and future research ideas. The first is based on the findings in the scoping review conducted in Study 1. The review identified 41 measures that represent sleep cognitions relevant for clinical or research purposes. With a wide range of measures available, it would be important to ascertain the content validity of these measures. This will enable researchers and clinicians to choose appropriate, high quality measures. This can be achieved by conducting a systematic review of all (or a subset) of the measures sourced in the scoping review and rate them against the COSMIN guidelines outlined by Terwee et al. (2018).

A second research area is to continue to develop and improve the PANSAM for the target population. This can include more direct research conducted with service users who have lived experience of mood difficulties. One way to achieve this could be a qualitative interview to explore in more detail people’s experience of sleep duration disturbances and their mood along with different belief systems that are endorsed. Additionally, another Delphi method study with service users exploring and identifying consensus on positive and negative sleep appraisals in the context of low and high mood states would be a valuable comparison and contribution to the outcome of the Delphi study conducted with professionals. More direct contribution from service users to the development and refinement of the PANSAM appraisal statements would strengthen the content validity of the measure and justify referring to it as a patient reported outcome measure.

Regardless of whether any further work adapting the PANSAM by service users is conducted, more validity and reliability testing should be completed for the PANSAM. This includes conducting a confirmatory factor analysis with the target population. This psychometric analysis would test the dimensionality of the PANSAM that was identified in
the exploratory factor analysis (Study 3 / Aim 2.1). Discriminative validity can be assessed again with slightly different eligibility criteria for the clinical groups. This can include separating the BD spectrum group into those who have experience of mania, hypomania, and those who meet bipolar at-risk criteria. Additionally, it would be useful to consider whether to take into account the time frame in which the person last experienced a mood episode. In the study by Mansell et al. (2011) participant groups were split between those who were remitted (last episode within two years) and those who were recovered (last episode over two years ago).

Finally, more research testing the proposed ICSM should be conducted. This can include a repeat of the diary study (Study 5), but with patients who meet clinical criteria for mood difficulties and sleep disturbances. It may be that with the convenience sample recruited in Study 5, TST variability was not adequately captured. A clinical population who experience elevated and low mood states, as well as who report (and are assessed for) periods of insomnia, hypersomnia and reduced need for sleep may better highlight the PANSAM’s predictive ability. In addition, a methodology should be employed in order to capture an increase in sleep variability over time in order to accurately assess the PANSAM’s predictive usefulness.

8.10. Conclusion

This thesis investigated the positive and negative sleep appraisals that may play an important role in the development and maintenance of sleep disruption experienced across the mood continuum. An achievement of this thesis was the development of a new measure, the PANSAM, which assesses for these positive and negative sleep appraisals. The PANSAM has shown good initial validity and reliability in psychometric tests that were conducted throughout the studies of this thesis. Although the sleep research field is focused on insomnia, the PANSAM has shown to offer unique contributions and highlighted that appraisals other than negative beliefs about insomnia are important. This thesis also highlights that the proposed ICSM warrants further investigation. With sleep such an important feature of BD mood episodes, it is important to better understand the sleep disturbances and the mechanisms that underpin them in order to develop more interventions that can target an at-risk state. With more work that should be conducted, the ICSM may continue to show evidence as a useful model to use in conjunction with the ICM for cognitive intervention approaches to mood and sleep disturbances.


201


Appendix 1: Pilot Study – PANSAM Feedback Responses

### Question 1: Was this questionnaire easy to complete?

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Moderately easy</td>
<td>Some of them are a bit oddly worded and feel more like &quot;yes&quot; or &quot;no&quot; questions than circle a number.</td>
</tr>
<tr>
<td>2</td>
<td>Very easy</td>
<td>Questions was wrote out easy to understand and more in depth questions.</td>
</tr>
<tr>
<td>3</td>
<td>Very easy</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Very easy</td>
<td>Very easy</td>
</tr>
<tr>
<td>5</td>
<td>Very easy</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Very easy</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Very easy</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Very easy</td>
<td>Easier to understand</td>
</tr>
</tbody>
</table>

### Question 2: Was this questionnaire easy to understand?

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Understandable</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Very easy to understand</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Understandable</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Very easy to understand</td>
<td>Very easy to understand. Well written &amp; explained.</td>
</tr>
<tr>
<td>5</td>
<td>Very easy to understand</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Very easy to understand</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Very easy to understand</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Very easy to understand</td>
<td></td>
</tr>
</tbody>
</table>
**Question 3: How well does this questionnaire capture the way you think about sleep?**

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slightly well</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Very well</td>
<td>The questions asked was things I related to but wouldn’t of said if not asked.</td>
</tr>
<tr>
<td>3</td>
<td>Very well</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Well</td>
<td>Well. Made me realised how little sleep I get!</td>
</tr>
<tr>
<td>5</td>
<td>Well</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Very well</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Moderately well</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Very well</td>
<td></td>
</tr>
</tbody>
</table>

**Question 4: How important do you think the beliefs in this questionnaire relate to your mood?**

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Important</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Very important</td>
<td>Yes all the questions made me think about my mood.</td>
</tr>
<tr>
<td>3</td>
<td>Very important</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Very important</td>
<td>Very important</td>
</tr>
<tr>
<td>5</td>
<td>Very important</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Very important</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Important</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Important</td>
<td></td>
</tr>
</tbody>
</table>
**Question 5: How well do the items in this questionnaire relate to high mood?**

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slightly well</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Very well</td>
<td>The questions made me think about sleep in my high mood and not just my low.</td>
</tr>
<tr>
<td>3</td>
<td>Very well</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Moderately well</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Well</td>
<td>What's caused high mood? maybe brief scenarios from the day.</td>
</tr>
<tr>
<td>6</td>
<td>Very well</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Well</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Moderately well</td>
<td></td>
</tr>
</tbody>
</table>

**Question 6: How well do the items in this questionnaire relate to low mood?**

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Moderately well</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Very well</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Very well</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Well</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Well</td>
<td>Both high and low are more balanced and general which helped massively to answer compared to the other</td>
</tr>
<tr>
<td>6</td>
<td>Very well</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Moderately well</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Very well</td>
<td></td>
</tr>
</tbody>
</table>
### Question 7: How well do the items in this questionnaire relate to anxiety?

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Well</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Well</td>
<td>I didn’t answer high on the anxiety questions but it would be good for someone who would.</td>
</tr>
<tr>
<td>3</td>
<td>Very well</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Very well</td>
<td>I have GAD and could relate my answers very well.</td>
</tr>
<tr>
<td>5</td>
<td>Well</td>
<td>Indirectly, but definitely does.</td>
</tr>
<tr>
<td>6</td>
<td>Very well</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Well</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Slightly well</td>
<td></td>
</tr>
</tbody>
</table>

### Question 8: What problems have you noticed with this questionnaire? (e.g. wording, length, does it annoy you?)

<table>
<thead>
<tr>
<th>PPT#</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I would say the wording alone. Some questions (as I wrote earlier) feel more like yes/no questions that require a bit of expansion by participants to get an accurate result.</td>
</tr>
<tr>
<td>2</td>
<td>No problems.</td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>No, no complaints.</td>
</tr>
<tr>
<td>5</td>
<td>Again, maybe some context would help but not completely essential.</td>
</tr>
<tr>
<td>6</td>
<td>N/A</td>
</tr>
<tr>
<td>7</td>
<td>More skewed towards higher, more stable moods rather than looking at negative and positive mood equally.</td>
</tr>
<tr>
<td>8</td>
<td>None</td>
</tr>
</tbody>
</table>
**Question 9: What have you liked about this questionnaire?**

<table>
<thead>
<tr>
<th>PPT#</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Short and sweet.</td>
</tr>
<tr>
<td>2</td>
<td>I liked how many questions there was and how in depth way was. Covered all aspects.</td>
</tr>
<tr>
<td>3</td>
<td>Seems more relevant to mood and beliefs than others.</td>
</tr>
<tr>
<td>4</td>
<td>Simple, straight to the point.</td>
</tr>
<tr>
<td>5</td>
<td>Easier, more balanced and universally relatable</td>
</tr>
<tr>
<td>6</td>
<td>N/A</td>
</tr>
<tr>
<td>7</td>
<td>Easy to follow.</td>
</tr>
<tr>
<td>8</td>
<td>More centred around sleeping.</td>
</tr>
</tbody>
</table>

**Question 10: Any additional comments?**

<table>
<thead>
<tr>
<th>PPT#</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nothing I haven't already written.</td>
</tr>
<tr>
<td>2</td>
<td>Best questionnaire I've filled in on sleep.</td>
</tr>
<tr>
<td>3</td>
<td>I don't man, I just like this one's better.</td>
</tr>
<tr>
<td>4</td>
<td>Well written questionnaire.</td>
</tr>
<tr>
<td>5</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>N/A</td>
</tr>
<tr>
<td>7</td>
<td>None</td>
</tr>
<tr>
<td>8</td>
<td>None</td>
</tr>
</tbody>
</table>
## Appendix 2: Pilot Study – DBAS Feedback Responses

### Question 1: Was this questionnaire easy to complete?

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Easy</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Not at all</td>
<td>Questions had harder words and was wrote for a certain age group.</td>
</tr>
<tr>
<td>3</td>
<td>Easy</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Very easy</td>
<td>Very easy</td>
</tr>
<tr>
<td>5</td>
<td>Moderately</td>
<td>There's a lot of hypothetical questions for someone who doesn't suffer from insomnia.</td>
</tr>
<tr>
<td>6</td>
<td>Easy</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Easy</td>
<td>Straight forward, but a few contradictory</td>
</tr>
<tr>
<td>8</td>
<td>Slightly easy</td>
<td></td>
</tr>
</tbody>
</table>

### Question 2: Was this questionnaire easy to understand?

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Understandable</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Slightly understandable</td>
<td>I didn't understand some questions and they wasn't relevant to me at all.</td>
</tr>
<tr>
<td>3</td>
<td>Very easy to understand</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Understandable</td>
<td>Very easy to understand</td>
</tr>
<tr>
<td>5</td>
<td>Understandable</td>
<td>I think some points could be worded better but overall good.</td>
</tr>
<tr>
<td>6</td>
<td>Very easy to understand</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Very easy to understand</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Slightly understandable</td>
<td></td>
</tr>
</tbody>
</table>
**Question 3: How well does this questionnaire capture the way you think about sleep?**

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slightly well</td>
<td>There are certain questions that do not apply to me personally e.g. night cap. I don't drink alcohol of any kind, or having a partner. I am very very single, also if I weren't single my partner wouldn't be staying the night, he's not even getting a drawer.</td>
</tr>
<tr>
<td>2</td>
<td>Not at all well</td>
<td>I didn't really ask questions like that.</td>
</tr>
<tr>
<td>3</td>
<td>Moderately well</td>
<td>It seems to assume the existence of sleep disorders rather than beliefs</td>
</tr>
<tr>
<td>4</td>
<td>Very well</td>
<td>Anxiousness definitely affects my sleep</td>
</tr>
<tr>
<td>5</td>
<td>Well</td>
<td>Again, a lot of the points don't relate to my situation in particular but as a transferable document works fine.</td>
</tr>
<tr>
<td>6</td>
<td>Well</td>
<td>More factors, stress anxiety daily activities.</td>
</tr>
<tr>
<td>7</td>
<td>Moderately well</td>
<td>Does cover a lot, but misses a few points. Medicated? Is there anything which you do to sleep?</td>
</tr>
<tr>
<td>8</td>
<td>Moderately well</td>
<td></td>
</tr>
</tbody>
</table>

**Question 4: How important do you think the beliefs in this questionnaire relate to your mood?**

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Important</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Not at all important</td>
<td>I thought the questionnaire didn’t relate to my moods at all.</td>
</tr>
<tr>
<td>3</td>
<td>Very important</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Very important</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Important</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Moderately important</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Very important</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>MISSING</td>
<td></td>
</tr>
</tbody>
</table>
**Question 5: How well do the items in this questionnaire relate to high mood?**

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slightly well</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Not at all well</td>
<td>I didn't answer one question I thought related to that.</td>
</tr>
<tr>
<td>3</td>
<td>Not at all well</td>
<td>Can't see high mood related questions.</td>
</tr>
<tr>
<td>4</td>
<td>Well</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Not at all well</td>
<td>Very few of the points are obviously directly related to high mood. If any. Some points I'd see as normal sleep behaviour.</td>
</tr>
<tr>
<td>6</td>
<td>Very well</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Not at all well</td>
<td>Covers alot more lower mood.</td>
</tr>
<tr>
<td>8</td>
<td>Slightly well</td>
<td></td>
</tr>
</tbody>
</table>

**Question 6: How well do the items in this questionnaire relate to low mood?**

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slightly well</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Moderately well</td>
<td>There wasn't enough questions but more than high moods.</td>
</tr>
<tr>
<td>3</td>
<td>Slightly well</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Very well</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Well</td>
<td>Much more about negative impacts / anxiety / inability to complete tasks which I would more associate with low mood.</td>
</tr>
<tr>
<td>6</td>
<td>Very well</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Very well</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Very well</td>
<td></td>
</tr>
</tbody>
</table>
### Question 7: How well do the items in this questionnaire relate to anxiety?

<table>
<thead>
<tr>
<th>PPT #</th>
<th>Quantitative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slightly well</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Not at all well</td>
<td>I didn't think any question related to anxiety.</td>
</tr>
<tr>
<td>3</td>
<td>Moderately well</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Very well</td>
<td>Relatable!</td>
</tr>
<tr>
<td>5</td>
<td>Well</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Not at all well</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Slightly well</td>
<td>Doesn't cover too much on anxiety. Could be more covered.</td>
</tr>
<tr>
<td>8</td>
<td>Well</td>
<td></td>
</tr>
</tbody>
</table>

### Question 8: What problems have you noticed with this questionnaire? (e.g. wording, length, does it annoy you?)

<table>
<thead>
<tr>
<th>PPT#</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Some of the questions don't work on a scale. They require more information to get a result and alot of them don't apply to me personally.</td>
</tr>
<tr>
<td>2</td>
<td>Wording isn't right for all ages. Wasn't enough questions about mood, only for older people.</td>
</tr>
<tr>
<td>3</td>
<td>Title - People might be more guarded due to &quot;dysfunctional&quot; being in the title</td>
</tr>
<tr>
<td>4</td>
<td>None, well written.</td>
</tr>
<tr>
<td>5</td>
<td>Some difficulty relating. Parts very general i.e. age related - alot of factors come into lifestyle as you age.</td>
</tr>
<tr>
<td>6</td>
<td>More stress and anxiety related questions.</td>
</tr>
<tr>
<td>7</td>
<td>Fairly standard wording. Easy to follow.</td>
</tr>
<tr>
<td>8</td>
<td>None</td>
</tr>
</tbody>
</table>
**Question 9: What have you liked about this questionnaire?**

<table>
<thead>
<tr>
<th>PPT#</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Easy to understand, straight to the point.</td>
</tr>
<tr>
<td>2</td>
<td>Nothing</td>
</tr>
<tr>
<td>3</td>
<td>The end</td>
</tr>
<tr>
<td>4</td>
<td>Relatable questions. Makes you think!</td>
</tr>
<tr>
<td>5</td>
<td>It makes you think about parts of your sleep routine which you may not have. There are many in between answers. Concise yes / no / 50-50.</td>
</tr>
<tr>
<td>6</td>
<td>Varied amount of questions.</td>
</tr>
<tr>
<td>7</td>
<td>Has a broad spectrum of questions to answer.</td>
</tr>
<tr>
<td>8</td>
<td>Nothing in particular</td>
</tr>
</tbody>
</table>

**Question 10: Any additional comments?**

<table>
<thead>
<tr>
<th>PPT#</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Great questionnaire.</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>N/A</td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Nope</td>
</tr>
</tbody>
</table>
Appendix 3: Study 2 / E-mail Invite

Subject line:
Development of Mood / Sleep Questionnaire- Your views’ are needed!

Hello,

We are inviting you to take part in the development and consensus of a sleep questionnaire.

This questionnaire will hopefully be used in the context of sleep difficulties experienced by people with mood difficulties. The aim of this questionnaire will be to explore positive and negative beliefs about sleep, in the context of low and elevated mood states.

We want to find out expert’s suggestions, feedback, and consensus for these different sleep beliefs. I am familiar with your published work in the field of bipolar disorder. It would be hugely appreciated if you could provide your expert opinion for this survey.

We would like you to complete the questionnaire, which is available through the link at the end of this e-mail. You will be taken to a Participant Information Sheet which details the study further. Completing the survey should take no more than 30 minutes.

If you do not want to take part, please ignore this e-mail or you can send a reply e-mail asking for no further contact.

If you have any questions please do not hesitate to get in touch with myself (contact details below) or either of my supervisors:

☐ Dr. Warren Mansell (PhD Supervisor); warren.mansell@manchester.ac.uk
☐ Dr. Sophie Parker (PhD Supervisor); sophie.parker@gmw.nhs.uk

Questionnaire: https://apps.mhs.manchester.ac.uk/surveys//TakeSurvey.aspx?SurveyID=92015772

Thank you very much for your help!

Lydia Pearson
PhD Student in Clinical Psychology
School of Psychological Sciences
University of Manchester
Zochonis Building, 2nd Floor,
Brunswick Street
Manchester
M13 9PL
Work Mobile: 07827 903 300
Appendix 4: Study 2 / Participant Information Sheet

Study Title:
The development of a sleep questionnaire exploring extreme positive and negative beliefs about sleep: A Delphi study with professionals.

What is the purpose of the study?
Sleep is known to be linked with mood, both as a potential trigger for changes in mood and also as a consequence of mood states. Much work has been done to understand the processes involved in the sleep difficulty insomnia. However, a person might experience significant changes in their sleep pattern that do not include only insomnia. For example, a person might experience difficulties with initiating and maintaining sleep when low in mood, but when in elevated mood might find they don’t need sleep and will be busier than normal.

The Integrative Cognitive Model (ICM) is a transdiagnostic model that proposes a person with extreme mood states endorses extreme and conflicting beliefs about those mood states, which in turn drive their mood up and down. We would like to apply the same principles of the ICM to the unhelpful belief systems that may be in place regarding sleep. In order to apply the same principles of the ICM to possible unhelpful sleep beliefs, we would like to develop a questionnaire that will assess for both extreme positive and negative beliefs a person may endorse for both sleeping less and more than usual.

Who can take part?
You have been identified through professional networks as someone who has experience working with people with significant mood difficulties. If you have any colleagues who you feel might be suitable to take part in this study also, please feel free to forward the study link to them as well.

Participant Criteria:
1) Minimum training level of either qualified occupational therapist, qualified social worker, research assistant, grade 6 nurse, CBT therapist, trainee clinical psychologist, or junior doctor.
2) at least 1 years’ experience working with people who experience significant low and elevated mood difficulties (e.g. bipolar disorder) AND who have reported sleep difficulties (e.g. initiating, maintaining, or not needing sleep).

What will happen to me if I take part?
Taking part will involve completing a Delphi survey. This will involve up to three rounds of questions exploring extreme positive and negative beliefs a person may endorse about sleeping more or less.

Round 1 will involve reviewing belief statements that have been developed by the research team. You will be asked to keep in mind the clients you have worked with and choose how important you feel each belief statement is on a scale of "Essential" to "Do not include". You will have the option of providing feedback for the statements (e.g. word changes). In Round 1, you will also have the option of adding more beliefs you may be aware of from your clinical experience.

For Round 2, the research team will have thematically analysed the feedback from the participants and will have amended the statements as necessary. These statements will be sent out the participants again for further consensus checking based on the participants
ratings of "Essential" to "Do not include" with the additional option of feedback about word changing, etc.

A 3rd round may be completed if there are any statements that need a further consensus check. The same rating of "Essential" to "Do not include" will be completed.

**Are there any benefits in my taking part?**
If you choose to take part in this study, it is hoped you will find the experience of collaborating with other experts in the field of mood difficulties an exciting opportunity.

**Are there any risks involved?**
There should not be any risks involved in taking part in this study. The study will involve you committing some time to taking part (up to 30 minutes max for each round of the study). We hope that the availability of the study online will make it easier for you to complete when you have time to do so.

**Will my participation be confidential?**
The only personal information that will be collected as part of the study will be the participants e-mail address and general demographic information. We request your e-mail address so that we can know who took part and to re-contact for Round 2 and 3. We will also collect some demographic information (age, sex, professional role, length of time in job role, etc). This demographic information will be anonymous and will be kept separate to the survey responses, along with the e-mail address.

All information and data collected during the study will be looked at and shared with the research team. It will be stored securely and confidentially in line with the Data Protection Act and University of Manchester Policy.

**What happens if I change my mind?**
Taking part in the survey is completely voluntary and you do not have to take part. Should you like to take part you will be asked to confirm you meet the participant criteria on this online survey form and can proceed to the questions.

You can withdraw from future stages of the study at any time by either letting the researcher know when they re-contact you via e-mail, or by not completing future rounds of the survey.

**What happens if something goes wrong?**
If you have a concern about any aspect of this study, you should speak to the researchers who will do their best to answer any questions you may have. If they are unable to resolve your concern or you wish to make a complaint regarding the study, you can contact a University Research Practice and Governance Co-ordinator on 0161 275 7583 or 0161 275 8093 or by e-mail to Research.Complaints@manchester.ac.uk.

**Where can I get more information?**
If you would like to discuss this study any further please contact either:

Lydia Pearson (PhD Researcher)
Lydia.Pearson@postgrad.manchester.ac.uk
Work Mobile: 07827 903 300
Dr. Warren Mansell (PhD Supervisor)
Warren.Mansell@manchester.ac.uk
0161 275 8589

Dr. Sophie Parker (PhD Supervisor)
Sophie.Parker@gmw.nhs.uk
0161 358 1395

E-mail link to the survey (LIVE):
Appendix 5 – Study 2 / Research Team Appraisal

Statements

1. When I sleep more than normal, I can stop myself thinking about all the bad things that are happening to me.
2. I sleep more to keep myself safe from my extreme moods.
3. I sleep more to keep others safe from my extreme moods.
4. I sleep more to escape from the real world.
5. I have to sleep more than normal to make up for my lost sleep when I've been too excited.
6. The only time I can relax is when I am fast asleep.
7. When I sleep more, I become a zombie.
8. Sleep prevents me from completing my many projects.
9. When I sleep more than normal I feel so useless.
10. When I sleep for too long, I can't sleep at all the next night.
11. I worry that something bad will happen if I sleep too long.
12. If I only need a few hours of sleep, it is a sign that I'm on top of things.
13. I will stay up very late or all night to avoid feeling bored.
14. I will stay up very late or all night to bring on my elevated mood.
15. It is necessary for me to stay up very late or all night to get all of my work done.
16. I will stay up very late or all night because of all my good ideas.
17. I will stay up very late or all night because this is when I feel most creative.
18. I will stay up very late or all night when I have elevated mood because this is when I feel my best.
19. The less I sleep, the less I get bothered by low mood.
20. I need to sleep as little as possible to get everything done.
21. To show how important I am, I have not got time for sleep.
22. If I do not get enough sleep each night, I become extremely anxious.
23. If I do not get enough sleep each night, I won't be able to function at all the next day. (Discarded)
24. If I do not get enough sleep each night, I will not be able to engage in any activities the next day.
25. If I do not get enough sleep each night, I will look physically awful.
26. I can't sleep too much because I need to be alert for danger.
27. I am unable to sleep to much because I am too alert for danger.
28. If I do not get enough sleep each night, my moods become uncontrollable.
29. If I do not get enough sleep each night, this will have a terrible impact on my health in the future.
30. If I do not get enough sleep each night, I will feel physical pain.
31. The more I worry about not sleeping, the less I sleep.
Appendix 6 – Study 2 / Outcome of Round 1

1. The only way I can stop myself thinking is to sleep more than normal
2. I sleep more to stop myself from doing things I might regret.
3. I sleep more in the hope I will be a nicer person
4. I sleep more to escape from the real world.
5. I have to sleep more than normal to make up for my lost sleep when I've been too excited
6. The only time I can relax is when I am fast asleep.
7. When I sleep more than normal I feel disconnected from everything
8. Sleep prevents me from completing my many projects.
9. When I sleep more than normal I feel so useless.
10. When I sleep for too long, I can't sleep at all the next night.
11. If I only need a few hours of sleep, it is a sign that I'm on top of things.
12. I stay up very late or all night to avoid feeling like a failure
13. I stay up very late or all night to bring on my elevated mood.
14. It is necessary for me to stay up very late or all night to get all of my work done
15. I stay up very late or all night because of all my good ideas
16. I stay up very late or all night because this is when I feel most creative
17. I stay up very late or all night when I have elevated mood, because this is when I feel my best.
18. The less I sleep, the more likely it is I get everything done.
19. Really important and successful people don't need sleep.
20. If I do not get enough sleep each night, I become extremely anxious
21. If I do not get enough sleep each night, I won't be able to function at all the next day.
22. If I do not get enough sleep each night I will not be able to get done what needs to be done the next day.
23. If I do not get enough sleep at night everyone will think I look exhausted.
24. I can't sleep too much because I need to be on guard for possible threats.
25. If I do not get enough sleep each night, my moods become uncontrollable.
26. If I do not get enough sleep each night, this will have a terrible impact on my health in the future.
27. If I do not get enough sleep at night, this will have a terrible impact on me the next day.
28. If I do not get enough sleep, I will feel it in my body.
29. The more I worry about not sleeping, the less I sleep.
30. I sleep less to give myself a lift.
31. When I know there is something difficult coming up, I sleep less to give myself a lift.
32. If I do not get enough sleep, I could end up causing harm to others.
33. Sleeping less keeps my senses sharp.
34. Sleeping too much is a sign that I am becoming depressed.
35. I have to sleep more to keep my mood stable.
36. I put off sleep because I am scared what I might dream about.
37. Other people like me more when I don't sleep.
38. Sleeping too much is a waste of time.
### Appendix 7 – Study 2 / Outcome of Delphi and PANSAM subscales

<table>
<thead>
<tr>
<th>Sleeping More / Negative</th>
<th>Sleeping Less / Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>When I sleep more than normal I feel disconnected from everything.</td>
<td>If I do not get enough sleep each night, I become extremely anxious.</td>
</tr>
<tr>
<td>When I sleep more than normal I feel so useless.</td>
<td>If I do not get enough sleep each night, I won’t be able to function the next day.</td>
</tr>
<tr>
<td>When I sleep for too long, I can’t sleep at all the next night.</td>
<td>If I do not get enough sleep each night I will not be able to get done what needs to be done the next day.</td>
</tr>
<tr>
<td>Sleep prevents me from completing my many projects.</td>
<td>If I do not get enough sleep each night, everyone will think I look exhausted.</td>
</tr>
<tr>
<td>I can’t sleep too much because I need to be on guard for possible threats.</td>
<td>If I do not get enough sleep each night, my moods become uncontrollable.</td>
</tr>
<tr>
<td>If I do not get enough sleep at night, this will have a terrible impact on me the next day.</td>
<td>The more I worry about not sleeping, the less I sleep.</td>
</tr>
<tr>
<td>Sleeping too much is a sign that I am becoming depressed.</td>
<td>If I do not get enough sleep, I could end up causing harm to others.</td>
</tr>
<tr>
<td>Sleeping too much is a waste of time.</td>
<td>I put off sleep because I am scared what I might dream about.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sleeping More / Positive</th>
<th>Sleeping Less / Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>The only way I can stop myself thinking is to sleep more than normal.</td>
<td>If I only need a few hours of sleep, it is sign that I’m on top of things.</td>
</tr>
<tr>
<td>I sleep more to stop myself from doing things I might regret.</td>
<td>I stay up very late or all night to avoid feeling like a failure.</td>
</tr>
<tr>
<td>When I get more sleep, I feel stronger and more capable.</td>
<td>I stay up very late or all night to bring on my elevated mood.</td>
</tr>
<tr>
<td>I sleep more to escape from the real world.</td>
<td>I stay up very late or all night because of all my good ideas.</td>
</tr>
<tr>
<td>I have to sleep more than normal to make up for my lost sleep when I’ve been too excited.</td>
<td>Sleeping less keeps my senses sharp.</td>
</tr>
<tr>
<td>The only time I can relax is when I am fast asleep.</td>
<td>I stay up very late or all night when I have elevated mood, because this is when I feel my best.</td>
</tr>
<tr>
<td>I have to sleep more to keep my mood stable.</td>
<td>The less I sleep, the more likely it is I get everything done.</td>
</tr>
<tr>
<td>When I sleep for longer at night, it improves my health in the long run.</td>
<td>Really important and successful people don’t need sleep. I sleep less to give myself a lift.</td>
</tr>
</tbody>
</table>

*Shaded cells represent items that reached high consensus in the Delphi study*
Appendix 8: Final PANSAM

Positive and Negative Sleep Appraisal Measure (PANSAM)

Please read each of the statements below and make a rating in the right hand column to indicate how much you believe each one. Make your rating by intersecting the line between 0% (don’t believe this at all) to 100% (believe this completely). For example 50% means that the statement is 50:50, equally likely to be true or false for you.

Please now make a rating for each of the following items. Try not to think too much about each item. There are no right or wrong answers to this questionnaire and only your own opinion counts.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>I don't believe this at all</th>
<th>I believe this completely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>When I sleep more than normal I feel disconnected from everything.</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>If I do not get enough sleep each night, I become extremely anxious.</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>The only way I can stop myself thinking is to sleep more than normal.</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>If I only need a few hours of sleep, it is a sign that I’m on top of things.</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>When I sleep more than normal I feel so useless.</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>6</td>
<td>If I do not get enough sleep each night, I won’t be able to function the next day.</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>7</td>
<td>I sleep more to stop myself from doing things I might regret.</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>I stay up very late or all night to avoid feeling like a failure.</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>9</td>
<td>When I sleep for too long, I can’t sleep at all the next night.</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>10</td>
<td>If I do not get enough sleep each night I will not be able to get done what needs to be done the next day.</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>11</td>
<td>I sleep more to escape from the real world.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>12</td>
<td>I stay up very late or all night to bring on my elevated mood.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>13</td>
<td>Sleep prevents me from completing my many projects.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>14</td>
<td>If I do not get enough sleep each night, everyone will think I look exhausted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>15</td>
<td>I have to sleep more than normal to make up for my lost sleep when I’ve been too excited.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>16</td>
<td>I stay up very late or all night because of all my good ideas.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>17</td>
<td>I can’t sleep too much because I need to be on guard for possible threats.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>18</td>
<td>If I do not get enough sleep each night, my moods become uncontrollable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>19</td>
<td>The only time I can relax is when I am fast asleep.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>I stay up very late or all night when I have elevated mood, because this is when I feel my best.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>21</td>
<td>If I do not get enough sleep at night, this will have a terrible impact on me the next day.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>22</td>
<td>The more I worry about not sleeping, the less I sleep.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>23</td>
<td>I have to sleep more to keep my mood stable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>24</td>
<td>The less I sleep, the more likely it is I get everything done.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>25</td>
<td>Sleeping too much is a sign that I am becoming depressed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>
26 If I do not get enough sleep, I could end up causing harm to others.

27 When I sleep for longer at night, it improves my health in the long run.

28 Really important and successful people don’t need sleep.

29 Sleeping too much is a waste of time.

30 I put off sleep because I am scared what I might dream about.

31 When I get more sleep, I feel stronger and more capable.

32 I sleep less to give myself a lift.

33 Sleeping less keeps my senses sharp.
Appendix 9: Study 3 / Advertisement

Volunteers Needed for Study on the Role of Sleep and Extreme Appraisals of Sleep on Mood

We are looking for people to take part in a study that aims to learn more about sleep beliefs a person might have and whether those beliefs play a role in changes in mood.

Who is eligible?
Anyone who is over the age of 18 may take part, provided that you have not been diagnosed with a sleep disorder (e.g. sleep apnoea, narcolepsy, restless legs syndrome).

What does the study involve?
You will be asked to sign a consent form and then answer different questionnaires that explore your mood, your sleep quality, and different beliefs you have about your mood and your sleep. The study should take no longer than 30-45 minutes to complete.

How do I take part?
The study is available online. If you would like more information about the study, please feel free to contact Lydia Pearson:

Lydia.Pearson@postgrad.manchester.ac.uk
Work mobile: 07827 903 300
Appendix 10: Study 3 / Participant Information Sheet

The Role of Sleep and Extreme Appraisals of Sleep on Mood
Study 1

You are being invited to take part in a research study as part of a student PhD project. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Please ask if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for taking the time to read this.

Who will conduct this research?
Miss Lydia Pearson (Phd Student); Dr. Warren Mansell; and Dr. Sophie Parker
School of Psychological Sciences
University of Manchester
Zochonis Building, 2nd Floor,
Brunswick Street
Manchester
M13 9PL

What is the purpose of the research?
Sleep and mood are known to be closely linked. The purpose of this study is to learn more about the different sleep beliefs a person might have and whether those beliefs play a role in changes in mood. The study forms part of a PhD project. The project is supervised by Dr. Warren Mansell and Dr. Sophie Parker at the University of Manchester.

Is the study suitable for me?
You may take part if you are 18 or over and have not been diagnosed with a sleep disorder (e.g. sleep apnea, narcolepsy, restless legs syndrome). We are aiming to recruit 150 participants.

What would I be asked to do if I took part?
This is an online study. You will first be asked to read this Participant Information Sheet and sign a consent form. This consent form will have an optional point that will ask if you would like to be contacted for a second study attached to this one. Study 2 will only be available to people who live in the Greater Manchester (UK) area and who would be able to meet with the researcher at an agreed date and time at the University of Manchester. If you are interested in learning more about the 2nd study you can leave your e-mail address upon completion of the study.

Once you have signed the consent form you will then need to answer questions from different questionnaires that will explore your mood, your sleep, and different beliefs you might have. It should take no longer than 45 minutes to complete these questionnaires.

What happens to the data collected?
All the data will be stored securely on a University of Manchester password protected computer and on the University’s network server. The data will be analysed by the research team. The results of this research will potentially be published and/or presented to other researchers.

**How is confidentiality maintained?**
All information gathered during this study will be kept strictly confidential and will conform to the Data Protection Act of 1998 with respect to data collection, storage and destruction. The information will be securely stored and used for the sole purpose of this study. The data will be held by Lydia Pearson and can only be accessed by the researcher and the supervisors Dr. Warren Mansell and Dr. Sophie Parker. It will not be provided to third party members. Participants’ identities will remain completely anonymous after data collection.

**What happens if I do not want to take part or if I change my mind?**
It is up to you to decide whether or not to take part. If you do decide to take part, you will have access to this Participant Information Sheet and be asked to sign a consent form. If you decide to take part you are still free to withdraw, up to the point of submitting your completed questionnaires on SelectSurvey.net, without giving a reason and without detriment to yourself.

**Will I be paid for participating in the research?**
There will not be payments for research participants. However, the information provided in this study will be new and it will help develop our research in this area.

**What is the duration of the research?**
This online study should take no more than 45 minutes to complete. If you are contacted and invited to take part in the second study, this will be a two week sleep diary study that will take up to 160 minutes.

**Where will the research be conducted?**
You will be able to access this study online with SelecSurvey.net. This will allow you to complete the study in your own time (e.g. at home).

**Will the outcomes of the research be published?**
The results of this research will potentially be published and/or presented to other researchers.

**Who has reviewed the research project?**
The project has been reviewed by the University of Manchester Research Ethics Committee 2 (Ref: 16314).

**What if something goes wrong?**
Answering the questionnaires should not be harmful. However, some of the questions will be about the way you feel and about your sleep which may be upsetting. We would advise you to speak with your GP in the event you would like to discuss any concerns you have regarding your mood or sleep. Below are contact details for services you can get further support from:

**National Services**
- NHS Direct
  111 (free telephone)
• Samaritans  - Sleepio (an online tool that provides a digital sleep intervention)
  www.samaritans.org  www.sleepio.com

116 123 (free telephone #)

University of Manchester students

• University of Manchester Counselling Services
  0161 275 2864
  http://www.counsellingservice.manchester.ac.uk/

What if I want to make a complaint?

Minor complaints
If you have a minor complaint then you need to contact the researchers in the first instance.

DR. WARREN MANSELL  DR. SOPHIE PARKER
E-mail: Warren.Mansell@manchester.ac.uk  E-mail: Sophie.Parker@gmw.nhs.uk
0161 275 8589  0161 772 9233

Formal Complaints
If you wish to make a formal complaint or if you are not satisfied with the response you have gained from the researchers in the first instance, then please contact the Research Governance and Integrity Manager, Research Office, Christie Building, University of Manchester, Oxford Road, Manchester, M13 9PL, by e-mailing: research.complaints@manchester.ac.uk or by telephoning 0161 275 2674 or 275 2046.

What do I do now?
If you have any queries about the study or if you are interested in taking part then please contact the researchers:

MISS LYDIA PEARSON
E-mail: Lydia.Pearson@postgrad.manchester.ac.uk
Work Mobile: 07827 903 300

DR. WARREN MANSELL  DR. SOPHIE PARKER
E-mail: Warren.Mansell@manchester.ac.uk  E-mail: Sophie.Parker@gmw.nhs.uk
0161 275 8589  0161 772 9233
CONSENT FORM (Study 1)  
The Role of Sleep and Extreme Appraisals of Sleep on Mood

If you are happy to participate please read each point and initial in the corresponding box. Please note the final point is optional.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I confirm that I have read the attached information sheet (V4 (04/05/2017)) on the above project and have had the opportunity to consider the information and ask questions and had these answered satisfactorily.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving a reason and without detriment to myself.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>I understand what is required of me in participating in this study.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>I understand that all the information I provide will be kept strictly confidential in accordance to the Data Protection Act of 1998 with respect to data collection, storage, and destruction.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>I understand that the information collected about me will be used to support other research in the future, and may be shared anonymously with other researchers.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>I confirm I do not have a known or diagnosed sleep condition (e.g. narcolepsy, restless legs syndrome, sleep apnea).</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>I agree to take part in this study.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>(OPTIONAL) I agree to be contacted by the researcher to possibly take part in a 2nd study that will include a two week sleep diary. An allocated number of University of Manchester psychology undergraduates will have the opportunity to receive 10 credits for the completion of this study. This will be done through SONA.</td>
<td></td>
</tr>
</tbody>
</table>

I agree to take part in the above project:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant</td>
<td>Date</td>
<td>Signature</td>
</tr>
<tr>
<td>Researcher</td>
<td>Date</td>
<td>Signature</td>
</tr>
</tbody>
</table>
A STUDY OF BELIEFS ABOUT SLEEP & MOOD

Do you have experience of mood difficulties?
- Have you had depression?
- Have you had mood swings or a diagnosis of Bipolar Disorder?
- Are you aged 18 or older?

We are looking for people to take part in a study that aims to learn more about the relationship between sleep and mood.

If you are interested in taking part in the study, you will be asked some questions over the telephone about your mental health.

You will then attend a one-off assessment with a researcher that will last about 2 hours. During this visit you will have an interview & complete questionnaires.

Group 1 – Participants who experience both high and low mood swings (e.g. bipolar disorder)

Group 2 – Participants who experience feeling low in mood (e.g. depression)

How can I find out more?
To discuss taking part in this study, please contact:

Lydia Pearson (Research Assistant)
07827 903 300 / 0161 358 1863
Lydia.Pearson@postgrad.manchester.ac.uk

Please note that if you decide to take part we will need to inform your care provider (e.g. GP)
Appendix 13: Study 4 / Non-clinical Advertisement

A STUDY OF BELIEFS ABOUT SLEEP & MOOD

• Are you interested in taking part in research?

• Are you aged 18 or older?

We are looking for people to take part in a study that aims to learn more about the relationship between sleep and mood.

If you are interested in taking part in the study, you will first be asked some questions over the telephone about your mental health.

You will then attend a one off assessment with a researcher that will last about 2 hours. During this visit you will have an interview & complete questionnaires.

Participant Group
Participants who DO NOT experience difficulties with mental health, such as mood or anxiety difficulties (e.g. have NOT had depression).

How can I find out more?
To discuss taking part in this study, please contact:

Lydia Pearson (Research Assistant)
07827 903 300 / 0161 358 1863
Lydia.Pearson@postgrad.manchester.ac.uk
Appendix 14: Study 4 / Participant Information Sheet

Study of Beliefs about Sleep & Mood
Version 3 24/11/2017
IRAS ID: 224054

Information for Participants

You are being invited to take part in a research study. It is important for you to understand why the research is being done and what it will involve. Please take time to read the information carefully, and discuss it with others if you wish. Feel free to ask us if there is anything that is not clear, or if you would like more information. You may wish to read the information sheet more than once, and please take time to decide whether or not you wish to take part.

What is the purpose of the research?

Sleep and mood difficulties are known to have a significant negative impact on a person’s quality of life. One intervention that has been shown to be useful for people with sleep or mood difficulties is cognitive behaviour therapy (CBT). CBT is a talking therapy in which the beliefs a person has about their sleep or mood are identified and then targeted during treatment. Sleep and mood are known to be closely linked and so it is important that therapy address both if a person is having sleep and mood difficulties. This can be achieved by understanding the types of sleep beliefs a person has in both high and low mood. Two examples of these different sleep beliefs are: “I stay up very late or all night because of all my good ideas” and “If I do not get enough sleep each night, my moods become uncontrollable.”

The purpose of this study is to explore if sleep beliefs are different for people who experience difficulties with mood compared to people who do not experience the same difficulties with mood. The study forms part of a PhD project. The project is supervised by Dr. Warren Mansell and Dr. Sophie Parker at the University of Manchester.

Why have I been invited to participate?

We are inviting people who are 18 years or older to take part in the study if they meet one of three participant groups. The first group are those who experience mood swings. This may mean that at times you feel high in mood, which can include feeling energetic, activated and talkative. However, at other times you may feel low in mood which may mean you feel sad, tired, lacking in energy and get less pleasure from the things that you used to enjoy. This group will include anyone who has received a diagnosis of bipolar disorder, but also those people who experience mood swings and who do not have a diagnosis of a mood disorder.

The second group are those who experience low mood but who do not experience feeling high in mood. This group will include anyone who has received a diagnosis of depression.

The third group will be those who have not experienced mood swings or low mood and who have not received a diagnosis of a mood disorder or depression.
**Do I have to take part?**

No. As entry to the study is entirely voluntary, it is up to you to decide whether or not to take part. You should not feel under any pressure to make a decision. If you do decide to take part, you will be asked to sign a consent form. Even after signing, you are still free to withdraw at any time and without giving a reason. This will not affect any of the care you may receive now or in the future.

If you do decide to take part initially and then withdraw from the study, it would be useful for us to use the information received from you up to the point of withdrawal. We will ask for your permission to do this, and we will not use your information without your consent.

**What happens to me if I take part?**

After having given verbal consent for being referred to this study, or after referring yourself, your contact details (name, phone number, address, and any known recent risk or crisis issues) will be recorded on a confidential database. Only the research team will have access to this personal information and only for the amount of time that you are taking part in the study. Before additional information is collected from you, you will be asked to read this Participant Information Sheet.

Following at least 24 hours of having read this Participant Information Sheet, you will then have a phone conversation with the researcher who will discuss the study with you further and answer any questions you might have. The researcher will also conduct a brief screening check over the phone with questions about your experiences of mood and other mental health difficulties you may have experienced or are currently experiencing. This will allow the researcher to know if you are suitable to take part in the study. If you still wish to take part, the researcher will take additional information from you including who your GP is. This additional information collected will only be accessible by the research team and will only be stored for the duration you are taking part in the study. Following this, an appointment will then be arranged for the researcher to meet with you to conduct the research interview. You are welcome to invite someone along with you to the interview if you would like additional support.

At the appointment with the researcher, you will be asked to read and sign the consent form. The researcher will then begin a ‘detailed assessment’ which involves questions about your mood and other experiences you may have. Please be aware, there will also be questions about any current or previous suicidal thoughts or actions you may have had. Finally, you will also be asked to complete some rating scales. This appointment will last up to 2 hours. The researcher will offer you as many breaks as you need and the appointment can be spaced over two visits if you prefer. Alternatively, phone assessments can be conducted to complete the assessment interview and the questionnaires can be completed at a later time at home and collected separately by the researcher within 1 week of the assessment interview being completed.

For all of our participants, we will offer you a debrief sheet that will include information about services in your local area in case you have been affected by anything in the interview. You will also be offered a phone call by a member of the research team within 48 hours of your appointment. This will be an opportunity for you to discuss any issues, concerns, or questions you may have following your appointment.

**What are the advantages and disadvantages of taking part?**
It is possible that talking about some of these issues during the interview may be upsetting. You will have the opportunity to discuss any concerns you have with the researcher, including an optional phone call by the research team within 48 hours of your appointment. You are also free to withdraw from the study at any point without giving a reason. If you later decide you would like to withdraw from the research, this decision will not affect any care you may receive now or in the future.

**Will taking part in the study cost me anything?**

You will need to make the time to attend the assessment interview. The researcher will aim to make these appointments as convenient as possible. For example, the researcher may see you at your place of study, a local service, or your home.

**What if something goes wrong?**

Taking part in the study should involve no particular risks to you, although it is possible some of the questions you are asked may make you feel distressed. You do not have to answer any questions you do not wish too. In addition, the researcher has been trained to help minimise any distress arising in these circumstances.

**Minor complaints**

If you have a minor complaint then you need to contact the researcher(s) in the first instance.

MISS LYDIA PEARSON  
E-mail: Lydia.Pearson@postgrad.manchester.ac.uk  
Work Mobile: 07827 903 300

DR. WARREN MANSELL  
E-mail: Warren.Mansell@manchester.ac.uk  
0161 275 8589

DR. SOPHIE PARKER  
E-mail: Sophie.Parker@gmmh.nhs.uk  
0161 772 9233

**Formal Complaints**

If you wish to make a formal complaint or if you are not satisfied with the response you have gained from the researchers in the first instance then please contact either the University of Manchester or Greater Manchester Mental Health NHS Trust complaints departments:

University of Manchester -  
Research Governance and Integrity Manager, Research Office, Christie Building,  
University of Manchester, Oxford Road, Manchester, M13 9PL, by emailing: research.complaints@manchester.ac.uk or by telephoning 0161 275 2674 or 275 2046.

Greater Manchester Mental Health NHS Trust -  
GMMH Customer Care Team contact numbers: 0161 358 0600 or 0800 587 4793.  
E-mail: Customercare@gmmh.nhs.uk.

**Who will know I am participating in the study?**

All participant records are confidential and as such are stored in a lockable filing cabinet in an NHS building or on NHS computer password protected computer systems. All data collected will be anonymised and your records will be identifiable only by a unique
personal code. Other people involved in your care, such as your GP, may be informed of your participation in the study. We will ask for your consent to inform these people.

**Who will have access to information collected about me during this study?**

Your records from the study will be confidential just as your medical records are confidential. All your data from the study will be identifiable by a personalised number only and will be kept in a securely locked filing cabinet on NHS premises. Only the research team will have access to your data collected during the study. Some of this data may need to be shared with your care team. For participants who are referred by a mental health service within Greater Manchester Mental Health NHS Trust, your consent form will be shared with your GP. If you are under the care of a service, we may seek your consent to view your medical records.

In the event the researcher is concerned that either you or someone you know is in harm’s way at any point while you are taking part in the research study, it may become necessary for the researcher to share this information with a member of your care team or another health care service or agency. This would be to ensure the safety of yourself or the person in question. This would be discussed with you.

Individuals from the University of Manchester, NHS Trust or regulatory authorities may need to look at the data collected for this study to make sure the project is being carried out as planned. This may involve looking at identifiable data but all individuals involved in auditing and monitoring the study, will have a strict duty of confidentiality to you as a research participant.

Upon your completion with taking part in the study, all personal identifying information (e.g. name, address, phone number) will be destroyed. You will be asked if you would like to receive the outcome of the study when it is finished. If you opt in for this information to be posted or e-mailed to you, your contact details will be stored on a separate password protected database for this purpose and then destroyed once that information has been sent to you.

**What will happen to the results of the research?**

After the study is completed, we will analyse the results and submit them for publication in a scientific journal. Presentations may also be given at scientific conferences. All data will be anonymous and any identifying data will not be published. If you wish to know the outcome of our research, we will be happy to discuss this with you.

**Who is organising the research?**

The chief investigator is Lydia Pearson from Greater Manchester Mental Health NHS Foundation Trust (GMMH NHS) and the University of Manchester. The two supervisors are Dr. Warren Mansell (University of Manchester) and Dr. Sophie Parker (GMMH NHS and the University of Manchester).

The project will be based at Greater Manchester Mental Health NHS Trust Foundation Trust.

**Who has reviewed this study?**
The East Scotland Research Ethics Service REC 1, which has responsibility for scrutinising all proposals for medical research on humans, has examined the proposal and has raised no objections from the point of view of research ethics. It is a requirement that your records in this research, together with any relevant medical records, be made available for scrutiny by monitors from the University of Manchester and Greater Manchester Mental Health NHS Foundation Trust, whose role is to check that research is properly conducted and the interests of those taking part are adequately protected.

Please keep this information sheet. Thank you for considering this proposal.

If you want to discuss the study further, please contact:

**Lydia Pearson:**
Work Mobile: 07827 903 300

Work Landline: 0161 358 1863
E-mail: (Lydia.Pearson@postgrad.manchester.ac.uk)
Greater Manchester Mental Health NHS Foundation Trust
Rico House
Bury New Road
Prestwich
M25 3BL
Telephone: 0161 772 4642

**Additional support you can access:**

We would also advise you speak to your GP if you have any concerns about your sleep or your mood that you would like to discuss further. There are also organisations listed below that you can contact.

**NHS Direct** – 111 (24 hour service)

**Samaritans** – 116 123 (free telephone, 24 hour service)
[www.samaritans.org](http://www.samaritans.org)

**Sleepio** - (an online tool that provides a digital sleep intervention)
[www.sleepio.com](http://www.sleepio.com)
**Appendix 15: Study 4 / Clinical Participant Consent Form**

Study of Beliefs about Sleep & Mood  
Version 3 24/11/2017  
IRAS ID: 224054

---

**CONSENT FORM (Participant Groups 1 & 2)**

**Client Identification Number for this study:**

**Title of Project:** Study of Beliefs about Sleep & Mood

**Chief Investigator:** Lydia Pearson

<table>
<thead>
<tr>
<th></th>
<th>Please Initial Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I confirm that I understand the nature of the study proposed, having read and understood the information sheet dated 24/11/2017 (V3). I have had the opportunity to ask questions, and I am satisfied with the answers I received.</td>
</tr>
<tr>
<td>2.</td>
<td>I understand that my participation is voluntary, and that I am free to withdraw from the study at any time. Should I wish to withdraw, I understand that I can do so without giving reason, and without my medical care or legal rights being affected.</td>
</tr>
<tr>
<td>3.</td>
<td>I agree that you may inform my General Practitioner and my care team of my involvement in the study, and that a copy of my consent form will be sent to my GP.</td>
</tr>
<tr>
<td>4.</td>
<td>I agree that if there are concerns about mine or someone else’s safety, the researcher may need to share this information with someone outside of the research team or with a member of my care team.</td>
</tr>
<tr>
<td>5.</td>
<td>I agree that if I decide to withdraw from the study then the researchers can continue to use the data and information I have already given them unless I ask for this to be destroyed.</td>
</tr>
<tr>
<td>6.</td>
<td>I understand that all data collected will be anonymised.</td>
</tr>
</tbody>
</table>
7. I understand that anonymised data may be transferred outside of the trust by a secure method in order to be analysed by the research team.

8. I understand that data collected during the study may be looked at by individuals from the University of Manchester, Greater Manchester Mental Health NHS Foundation Trust, or from regulatory authorities where it is relevant to my taking part in this research. I give my permission for these individuals to access my records.

9. I understand that data collected during the study may be looked at by individuals from the University of Manchester, Greater Manchester Mental Health NHS Foundation Trust, or from regulatory authorities where it is relevant to my taking part in this research. I give my permission for these individuals to access my records.

<table>
<thead>
<tr>
<th>Name of Participant</th>
<th>Date</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Researcher</th>
<th>Date</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Original copy of the consent form for the researcher*

*1 copy of the consent form for the participant.*
Appendix 16: Study 4 / Non-Clinical Participant Consent Form

Study of Beliefs about Sleep & Mood
Version 3 24/11/2017
IRAS ID: 224054

Greater Manchester Mental Health NHS Foundation Trust

Study of Beliefs about Sleep & Mood

CONSENT FORM (Participant Group 3)

Client Identification Number for this study:

Title of Project: Study of Beliefs about Sleep & Mood

Chief Investigator: Lydia Pearson

<table>
<thead>
<tr>
<th>Please Initial Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I confirm that I understand the nature of the study proposed, having read and understood the information sheet dated 24/11/2017 (V3). I have had the opportunity to ask questions, and I am satisfied with the answers I received.</td>
</tr>
<tr>
<td>2. I understand that my participation is voluntary, and that I am free to withdraw from the study at any time. Should I wish to withdraw, I understand that I can do so without giving reason, and without my medical care or legal rights being affected.</td>
</tr>
<tr>
<td>3. I agree that if I decide to withdraw from the study then the researchers can continue to use the data and information I have already given them unless I ask for this to be destroyed.</td>
</tr>
<tr>
<td>4. I agree that if there are concerns about mine or someone else’s safety, the researcher may need to share this information with someone outside of the research team or with a member of my care team.</td>
</tr>
<tr>
<td>5. I understand that all data collected will be anonymised.</td>
</tr>
<tr>
<td>6. I understand that anonymised data may be transferred outside of the trust by a secure method in order to be analysed by the research team.</td>
</tr>
</tbody>
</table>
7. I understand that relevant sections of my data collected during the study may be looked at by individuals from the University of Manchester, Greater Manchester Mental Health NHS Foundation Trust, or from regulatory authorities where it is relevant to my taking part in this research. I give my permission for these individuals to access my records.

8. I agree to take part in the study.

<table>
<thead>
<tr>
<th>Name of Participant</th>
<th>Date</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Researcher</th>
<th>Date</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Original copy of the consent form for the researcher.*

*1 copy of the consent form for the participant.*
Appendix 17: Study 4 / Clinical GP Consent Letter Template

Study of Beliefs about Sleep & Mood
Version 1 26/09/2017
IRAS ID: 224054

GP Address
[INSERT GP Address]

PRIVATE & CONFIDENTIAL

[INSERT Date of Letter]

Dear [INSERT GP Name]

RE: [INSERT Participant Full Name]
DOB: [INSERT Participant date of birth]
ADDRESS: [INSERT Participant address]
NHS #: [INSERT NHS #]

The above participant has consented to take part in the following study:

A Study of Beliefs about Sleep and Mood

The study aims to explore if sleep beliefs are different for people who experience difficulties with mood compared to people who not experience the same difficulties with mood.

I met with [PARTICIPANT NAME] on [DATE(S) OF ASSESSMENT] to complete the assessment for the study. This assessment includes measures of high (The Young Mania Rating Scale) and low mood (Beck Depression Inventory; BDI-II). These are commonly used measures of experiences with a focus on high and low mood. The study only involves this one off assessment with the participant.
If you require any further information please do not hesitate to contact me.

Yours sincerely,

[INSERT Name of Chief Investigator]
Assistant Research Psychologist

Under the Supervision of
[INSERT Supervisor name]
Appendix 18: Study 4 / Participant Debrief Sheet

Study of Beliefs about Sleep & Mood

Thank you for participating in this research study. We hope that you have found it interesting and have not been upset by any of the topics discussed. However, if you have found any part of this experience to be distressing and you would like to discuss this, please speak with one of the researchers during normal working office hours (Mon-Fri; 9:00-5:00).

MISS LYDIA PEARSON
E-mail: Lydia.Pearson@postgrad.manchester.ac.uk
Work Mobile: 07827 903 300

DR. WARREN MANSELL
E-mail: Warren.Mansell@manchester.ac.uk
0161 275 8589

DR. SOPHIE PARKER
E-mail: Sophie.Parker@gmw.nhs.uk
0161 772 9233

We would also advise you speak to your GP if you have any concerns about your sleep or your mood that you would like to discuss further. There are also organisations listed below that you can contact.

National Organisations

NHS Direct – 111 (24 hour service)

Samaritans – 116 123 (free telephone, 24 hour service)
www.samaritans.org

Sleepio (an online tool that provides a digital sleep intervention)
www.sleepio.com

Greater Manchester area

- Self Help Services - works actively with people in the Greater Manchester area on a number of difficulties including anger, anxiety and depression:
  https://www.selfhelpservices.org.uk/

National Service

- Mind – Offers advice and support to anyone experiencing a mental health problem:
  https://www.mind.org.uk
  Tel: 0300 123 3393

- Self-Help Resources - For useful easy to read self-help material based on cognitive behaviour therapy principles, with a number of resources for mood difficulties, sleeping problems, etc.
  o http://www.ntw.nhs.uk/pic/selfhelp
Appendix 19: Study 5 / Advertisement

Volunteers Needed for Study on the Role of Sleep and Extreme Appraisals of Sleep on Mood

We are looking for people to take part in a study that aims to learn more about sleep beliefs a person might have and whether those beliefs play a role in changes in mood.

Who is eligible?
Anyone who is over the age of 18 may take part, provided that you have not been diagnosed with a sleep disorder (e.g. sleep apnea, narcolepsy, restless legs syndrome).

What does the study involve?
The study requires you complete different questionnaires that explore your mood, your quality of sleep, and different beliefs you have about your sleep and your mood at two different time points. You will also be asked to complete a sleep diary and wear a motion watch for 2 weeks.

Will I be reimbursed for my time?
An allocated number of undergraduate students will receive 10 credits.

How do I take part?
If you would like to take part, or would like more information about the study, please feel free to contact Lydia Pearson:

Lydia.Pearson@postgrad.manchester.ac.uk
Work mobile: 07827 903 300
Appendix 20: Study 5 / Participant Information Sheet

Participant Information Sheet Study 2 – V5 (04/05/2017)

The Role of Sleep and Extreme Appraisals of Sleep on Mood

Study 2

You are being invited to take part in a research study as part of a student PhD project. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Please ask if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Thank you for taking the time to read this.

Who will conduct this research?
Miss Lydia Pearson (Phd Student); Dr. Warren Mansell; and Dr. Sophie Parker
School of Psychological Sciences
University of Manchester
Zochonis Building, 2nd Floor,
Brunswick Street
Manchester
M13 9PL

What is the purpose of the research?
Sleep and mood are known to be closely linked. The purpose of this study is to learn more about the different sleep beliefs a person might have and whether those beliefs play a role in changes in mood. The study forms part of a PhD project. The project is supervised by Dr. Warren Mansell and Dr. Sophie Parker at the University of Manchester.

Why have I been chosen?
You may take part if you are 18 or over, have not been diagnosed with a sleep disorder (e.g. sleep apnea, narcolepsy, restless legs syndrome), and live in the Greater Manchester area. We are aiming to recruit 75 participants.

What would I be asked to do if I took part?
You will first be asked to read this Participant Information Sheet and agree a date and time to meet with the researcher (Lydia Pearson) at the Zochonis building at the University of Manchester for an initial testing session. This session should last no longer than 45 minutes. The researcher will explain the study to you and be able to answer any questions you might have. You will sign a consent form and then complete different questionnaires that explore your mood, your sleep, and different beliefs you might have.

You will then be given a sleep diary to complete every morning for the next 14 days. The researcher will explain the instructions on how to complete the sleep diary and will ask you if you would like to be reminded to complete it over the 14 days (Sleep Diary Reminder Form). The completion of the diary will take up to 5-10 minutes each day.
You will also be asked to wear a motion watch. This watch will need to be worn on your non-dominant wrist for the duration of the 14 days, except when you are in water (e.g. showering). It will collect information on your activity levels throughout each day. This information will be used alongside your sleep diary to determine your sleep each night.

You will then arrange a date/time to meet with the researcher at the end of the 14 days at Zochonis. At this final appointment with the researcher, you will hand in the completed sleep diary and also recomplete the questionnaires. This appointment should also last no more than 45 minutes.

**What happens to the data collected?**
All the data collected from the sleep diaries, the motion watch and the paper based questionnaires will be transferred on to an electronic database stored securely on a University of Manchester password protected computer and on the University’s network server. The original paper versions will be stored in a secure filing cabinet. The data from the motion watch will be deleted from the watch after it has been uploaded onto relevant computer software for anonymous analysis. This computer software will only be available on a secure University of Manchester computer. The data will be analysed by the research team. The results of this research will potentially be published and/or presented to other researchers.

**How is confidentiality maintained?**
All information gathered during this study will be kept strictly confidential and will conform to the Data Protection Act of 1998 with respect to data collection, storage and destruction. The information will be securely stored and used for the sole purpose of this study. The data will be held by Lydia Pearson and can only be accessed by the researcher and the supervisors Dr. Warren Mansell and Dr. Sophie Parker. It will not be provided to third party members. Participants’ identities will remain completely anonymous after data collection.

**What happens if I do not want to take part or if I change my mind?**
It is up to you to decide whether or not to take part. If you do decide to take part, you will be sent this Participant Information Sheet to review at least 24 hours before meeting with the researcher (Lydia Pearson). At this appointment you will be asked to sign a consent form. If you decide to take part you are still free to withdraw, up to the point of completing the two week diary study, without giving a reason and without detriment to yourself.

**Will I be paid for participating in the research?**
There will not be payments for research participants. However, the information provided in this study will be new and it will help develop our research in this area. An allocated number of undergraduate students will also have the opportunity to earn 10 credits for the completion of the study.

**What is the duration of the research?**
The two week diary study is expected to take up to 160 minutes in total.

**Where will the research be conducted?**
You will need to meet with the researcher at two time points at the University of Manchester (Zochonis building). You will also be completing the sleep diary daily. This can be done at home, shortly after waking up.

**Will the outcomes of the research be published?**
The results of this research will potentially be published and/or presented to other researchers.

**Who has reviewed the research project?**
The project has been reviewed by the University of Manchester Research Ethics Committee 2 (Ref: 16314).

**What if something goes wrong?**
Answering the questionnaires and completing the sleep diary should not be harmful. However, some of the questions will be about the way you feel and about your sleep which may be upsetting. We would advise you to speak with your GP in the event you would like to discuss any concerns you have regarding your mood or sleep. Below are contact details for services you can get further support from:

**National Services**

- NHS Direct
  111 (free telephone)
- Samaritans - Sleepio (an online tool that provides a digital sleep intervention)
  www.samaritans.org
  116 123 (free telephone #) www.sleepio.com

**University of Manchester students**

- University of Manchester Counselling Services
  0161 275 2864
  http://www.counsellingservice.manchester.ac.uk/

**What if I want to make a complaint?**

**Minor complaints**
If you have a minor complaint then you need to contact the researchers in the first instance during normal working office hours (Mon-Fri; 9:00-5:00).

**DR. WARREN MANSELL**
E-mail: Warren.Mansell@manchester.ac.uk
0161 275 8589

**DR. SOPHIE PARKER**
E-mail: Sophie.Parker@gmw.nhs.uk
0161 772 9233

**Formal Complaints**
If you wish to make a formal complaint or if you are not satisfied with the response you have gained from the researchers in the first instance, then please contact the Research Governance and Integrity Manager, Research Office, Christie Building, University of Manchester, Oxford Road, Manchester, M13 9PL, by e-mailing: research.complaints@manchester.ac.uk or by telephoning 0161 275 2674 or 275 2046.

**What do I do now?**
If you have any queries about the study or if you are interested in taking part then please contact the researchers during normal working office hours (Mon-Fri; 9:00-5:00):
MISS LYDIA PEARSON
E-mail: Lydia.Pearson@postgrad.manchester.ac.uk
Work Mobile: 07827 903 300

DR. WARREN MANSELL
E-mail: Warren.Mansell@manchester.ac.uk
0161 275 8589

DR. SOPHIE PARKER
E-mail: Sophie.Parker@gmw.nhs.uk
0161 772 9233
CONSENT FORM (Study 2)
The Role of Sleep and Extreme Appraisals of Sleep on Mood

If you are happy to participate please read each point and initial in the corresponding box.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I confirm that I have read the attached information sheet (V5 (04/05/2017)) on the above project and have had the opportunity to consider the information and ask questions and had these answered satisfactorily.</td>
<td></td>
</tr>
<tr>
<td>2. I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving a reason and without detriment to myself.</td>
<td></td>
</tr>
<tr>
<td>3. I understand what is required of me in participating in this study.</td>
<td></td>
</tr>
<tr>
<td>4. I understand that all the information I provide will be kept strictly confidential in accordance to the Data Protection Act of 1998 with respect to data collection, storage, and destruction.</td>
<td></td>
</tr>
<tr>
<td>5. I agree to be reminded to fill out the diary as specified in the Sleep Diary Reminder Form.</td>
<td></td>
</tr>
<tr>
<td>6. I agree to wear the motion watch for the duration of the 14 days following the researchers instructions for care.</td>
<td></td>
</tr>
<tr>
<td>7. I understand that the information collected about me will be used to support other research in the future, and may be shared anonymously with other researchers.</td>
<td></td>
</tr>
<tr>
<td>8. I confirm I do not have a known or diagnosed sleep condition (e.g. narcolepsy, restless legs syndrome, sleep apnea).</td>
<td></td>
</tr>
<tr>
<td>9. I agree to take part in this study.</td>
<td></td>
</tr>
</tbody>
</table>

**I agree to take part in the above project:**

<table>
<thead>
<tr>
<th>Name of Participant</th>
<th>Date</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Researcher</th>
<th>Date</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 22: Study 3 & 5 / Participant Debrief Sheet

The Role of Sleep and Extreme Appraisals of Sleep on Mood

Thank you for participating in this two week sleep diary study. We hope that you have found it interesting and have not been upset by any of the topics discussed. However, if you have found any part of this experience to be distressing and you would like to discuss this, please speak with one of the researchers during normal working office hours (Mon-Fri; 9:00-5:00). You will also have the opportunity to discuss with the research assistant (Lydia Pearson) any questions or concerns at your final appointment.

MISS LYDIA PEARSON
E-mail: Lydia.Pearson@postgrad.manchester.ac.uk
Work Mobile: 07827 903 300

DR. WARREN MANSELL DR. SOPHIE PARKER
E-mail: Warren.Mansell@manchester.ac.uk E-mail: Sophie.Parker@gmw.nhs.uk
0161 275 8589 0161 772 9233

We would also advise you speak to your GP if you have any concerns about your sleep or your mood that you would like to discuss further. There are also organisations listed below that you can contact.

National Organisations

NHS Direct – 111 (24 hour service)
Samaritans – 116 123 (free telephone, 24 hour service)
www.samaritans.org
Sleepio (an online tool that provides a digital sleep intervention)
www.sleepio.com

University of Manchester students

University of Manchester counselling – 0161 275 2864
http://www.counsellingservice.manchester.ac.uk/

Please see below for a list of access points for support within and outside the University:

University of Manchester students

- Occupational Health - who also deal with student health:
  - http://www.occhealth.manchester.ac.uk/

- Online programmes - for low level anxiety and depression:
  - http://www.staffnet.manchester.ac.uk/personalsupport/counselling/self-help/

- Groups, Courses and Workshops - for a variety of psychological difficulties including anxiety and depression for both staff and students:
  - http://www.staffnet.manchester.ac.uk/personalsupport/counselling/courses/
• Student Union Wellbeing Service:
  o http://manchesterstudentsunion.com/top-navigation/advice-service/wellbeing-advice

Greater Manchester area

• 42nd Street - a reputable charity offering a social work and counselling service for under 25’s:
  o http://42ndstreet.org.uk/

• Self Help Services - works actively with people in the Greater Manchester area on a number of difficulties including anger, anxiety and depression:
  o https://www.selfhelpservices.org.uk/

National Service

• Mind – Offers advice and support to anyone experiencing a mental health problem:
  o https://www.mind.org.uk
  o Tel: 0300 123 3393

• Self-Help Resources - For useful easy to read self-help material based on cognitive behaviour therapy principles, with a number of resources for mood difficulties, sleeping problems, etc.
  o http://www.ntw.nhs.uk/pic/selfhelp
Appendix 23: Study 5 / Correlation Matrix

<table>
<thead>
<tr>
<th>PANSAM</th>
<th>DBAS</th>
<th>HAPPI</th>
<th>HYP</th>
<th>PHQ-9</th>
<th>PSQI</th>
<th>Sleep Distress</th>
<th>ISS Conflict</th>
<th>ISS Wellbeing</th>
<th>ISS Activation</th>
<th>ISS Depression</th>
<th>Sub. TST Variability</th>
<th>Obj. TST Variability</th>
</tr>
</thead>
<tbody>
<tr>
<td>PANSAM</td>
<td>.639**</td>
<td>.816**</td>
<td>.430**</td>
<td>.595**</td>
<td>.407**</td>
<td>.545**</td>
<td>.649**</td>
<td>-.103</td>
<td>.572**</td>
<td>.536**</td>
<td>.241</td>
<td>.338**</td>
</tr>
<tr>
<td>DBAS</td>
<td>.</td>
<td>.656**</td>
<td>.345**</td>
<td>.609**</td>
<td>.599**</td>
<td>.638**</td>
<td>.474**</td>
<td>-.258*</td>
<td>.356**</td>
<td>.387**</td>
<td>.280*</td>
<td>.208</td>
</tr>
<tr>
<td>HAPPI</td>
<td>.552**</td>
<td>.659**</td>
<td>.403**</td>
<td>.541**</td>
<td>.691**</td>
<td>-.201</td>
<td>.522**</td>
<td>.529**</td>
<td>.322*</td>
<td>.354**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HYP</td>
<td>.336**</td>
<td>.138</td>
<td>.273*</td>
<td>.399**</td>
<td>-.179</td>
<td>.296*</td>
<td>.313*</td>
<td>.251*</td>
<td>.329**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHQ-9</td>
<td>.600**</td>
<td>.625**</td>
<td>.656**</td>
<td>-.369**</td>
<td>.266*</td>
<td>.653**</td>
<td>.138</td>
<td>.145</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSQI</td>
<td></td>
<td></td>
<td></td>
<td>.630**</td>
<td>.344**</td>
<td>-.270*</td>
<td>.110</td>
<td>.290*</td>
<td>.227</td>
<td>.204</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep Distress</td>
<td></td>
<td></td>
<td></td>
<td>.472**</td>
<td>-.250*</td>
<td>.212</td>
<td>.355**</td>
<td>.225</td>
<td>.172</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISS Conflict</td>
<td></td>
<td></td>
<td></td>
<td>-.250*</td>
<td>.212</td>
<td>.355**</td>
<td>.040</td>
<td>.078</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISS Wellbeing</td>
<td></td>
<td></td>
<td></td>
<td>-.011</td>
<td>.415**</td>
<td>.194</td>
<td>.139</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISS Activation</td>
<td></td>
<td></td>
<td></td>
<td>.288*</td>
<td>.209</td>
<td>.232</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISS Depression</td>
<td></td>
<td></td>
<td></td>
<td>-.198</td>
<td>.067</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub. TST Variability</td>
<td></td>
<td></td>
<td></td>
<td>.663*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obj. TST Variability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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