

**UNDERSTANDING THE ROLE OF SYMPTOMS OF SLEEP DISTURBANCE IN
SUICIDAL PATHWAYS**

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

2018

DONNA L LITTLEWOOD

**SCHOOL OF HEALTH SCIENCES
Division of Psychology and Mental Health**

LIST OF CONTENTS

LIST OF TABLES.....	8
LIST OF FIGURES.....	9
LIST OF COMMON ABBREVIATIONS.....	10
ABSTRACT.....	11
LAY ABSTRACT.....	12
DECLARATION.....	13
Published work.....	13
Authorship and collaboration.....	13
COPYRIGHT STATEMENT.....	14
DEDICATION.....	15
ACKNOWLEDGEMENTS.....	16
CHAPTER 1.....	17
1. Introduction.....	17
1.1. Suicide.....	17
1.1.1. Factors associated with suicidal thoughts, behaviours and death by suicide.....	18
1.1.2. Psychological models of suicidal thoughts and behaviours.....	21
1.2. Sleep disturbance.....	23
1.2.1. Sleep disturbance as a transdiagnostic process in mental health.	25
1.3. The relationship between sleep disturbance, suicidal thoughts and acts.....	25
1.3.1. Sleep disturbance associated with suicidal thoughts and behaviours.....	26
1.3.2. Sleep disorders associated with suicidal ideation and behaviours.	27
1.3.3. Specific parameters of sleep associated with suicidal ideation and behaviours. ..	30
1.4. The role of psychological factors in the relationship between sleep disturbance suicidal thoughts and acts.....	32
1.5. Overarching thesis aims.....	34
1.5.1. Specific aims to be addressed by systematic review and empirical chapters.	34
CHAPTER 2.....	36
2. Methodological Considerations.....	36

2.1. Rationale for the involvement of a service user research group	36
2.2. Rationale for taking a mixed methods approach.....	36
2.3. Rationale for population focus on depression.	37
2.4. Study designs used in the thesis	38
2.4.1. Study 1: Systematic review.....	39
2.4.1.1. Rationale for a systematic review.....	40
2.4.2. Study 2: Qualitative interview study.	41
2.4.2.1. Rationale for analytical approach.....	41
2.4.2.2. Rationale for semi-structured interviews.	43
2.4.3. Study 3: Cross-sectional design.	45
2.4.3.1. Rationale for sample population.....	45
2.4.3.2. Rationale for secondary analysis of existing dataset.	45
2.4.3.3. Rationale for mediational analyses using bootstrapping procedure.	46
2.4.4. Study 4: Ecological momentary assessment (EMA).	46
2.4.4.1. Rationale for the EMA study design.....	47
2.4.4.2. Rationale for multilevel modelling.....	49
2.5. Overview of constructs examined.....	49
2.5.1. Sleep disturbance.....	51
2.5.2. Suicidal ideation and behaviour.	53
2.5.3. Comorbid symptoms of depression and anxiety.	55
2.5.4. Psychological factors	57
2.6. Safety of participants	57
CHAPTER 3.....	59
3. Examining the role of psychological factors in the relationship between sleep problems and suicide	59
3.1. Abstract	60
3.2. Introduction	60
3.2.1. Sleep problems as a modifiable risk factor for suicidality.....	61
3.2.2. Role of psychological processes in the association between sleep problems and suicidality.....	62
3.3. Method.....	64
3.3.1. Search strategy.	64
3.3.2. Eligibility criteria.....	64
3.3.3. Management of search outcomes and study eligibility screening.....	66
3.3.4. Quality appraisal.....	66
3.4. Results	67
3.4.1. Study characteristics.	67
3.4.2. Study quality.	74
3.4.3. Which psychological processes account for the association between sleep problems and suicidality?	75
3.4.3.1. Cognitive appraisals.....	75

3.4.3.1.1. Hopelessness.	75
3.4.3.1.2. Negative situational and self-appraisals.	77
3.4.3.1.3. Defeat and entrapment.	79
3.4.3.1.4. Summary of research examining cognitive appraisals.	80
3.4.3.2. Psychosocial factors.	81
3.4.3.2.1. Perceived burdensomeness, thwarted belongingness and social isolation.	81
3.4.3.2.2. Summary of research examining psychosocial factors.	84
3.4.3.3. Emotion regulation strategies.	84
3.4.3.3.1. Rumination and emotional regulation.	84
3.4.3.3.2. Summary of research examining emotion regulation strategies.	86
3.4.3.4. Risk behaviours.	86
3.4.3.4.1. Acquired capability for suicide.	86
3.4.3.4.2. Aggressive behaviour.	87
3.4.3.4.3. Summary of research examining risk behaviours.	87
3.5. Discussion	88
3.5.1. The role of psychological processes in the sleep/suicidality relationship.	90
3.5.1.1. Cognitive appraisals.	90
3.5.1.2. Psychosocial factors.	93
3.5.1.3. Emotion regulation strategies.	94
3.5.1.4. Risk behaviours.	96
3.5.2. Clinical implications.	97
3.5.3. Strengths and limitations of the review.	98
3.6. Conclusion	99
3.7. References	100
CHAPTER 4	107
4. Understanding the role of sleep in suicide risk: qualitative interview study	107
4.1. Abstract	108
4.2. Introduction	108
4.3. Methods	110
4.3.1. Study sample.	110
4.3.2. Procedure.	111
4.3.3. Analysis.	112
4.4. Results	112
4.4.1. Participant characteristics.	112
4.4.2. Thematic analysis of beliefs about the sleep-suicide relationship.	114
4.4.2.1. Being awake during the biological night.	115
4.4.2.2. Failure to achieve good sleep makes life harder.	117
4.4.2.3. Sleep provides an escape from waking-life problems.	119
4.5. Discussion	123
4.5.1. Principal findings.	123
4.5.2. Limitations.	124
4.5.3. Future research.	125

4.5.4. Clinical implications.....	126
4.6. References.....	126
CHAPTER 5.....	129
5. Nightmares and suicide in posttraumatic stress disorder: the mediating role of defeat, entrapment, and hopelessness.	129
5.1. Abstract	130
5.2. Introduction	131
5.3. Methods	134
5.3.1. Participants.....	134
5.3.2. Measures.	134
5.3.3. Procedure.	136
5.3.4. Analysis strategy.	136
5.4. Results	137
5.4.1. Sample characteristics.....	137
5.4.2. Preliminary analyses.....	138
5.4.3. Multiple mediation analyses.	139
5.5. Discussion	140
5.6. Conclusions.....	144
5.7. References.....	144
CHAPTER 6.....	147
6. Short sleep duration and poor sleep quality predict next-day suicidal ideation: An ecological momentary assessment study	147
6.1. Abstract	148
6.2. Introduction	149
6.3. Methods	153
6.3.1. Participants.....	153
6.3.2. Measures and procedure.	153
6.3.2.1. Screening.....	153
6.3.2.2. Pre-EMA assessment and briefing.....	154
6.3.2.3. Seven day EMA study procedure	155
6.3.2.4. Debriefing.....	156
6.3.3. Statistical analysis.....	157
6.4. Results	158
6.4.1. Participants.....	158
6.4.2. Adherence.	159
6.4.3. Does sleep disturbance predict higher levels of next-day suicidal ideation?.....	160

6.4.4. Do high levels of daytime suicidal ideation predict sleep disturbance the subsequent night?	161
6.4.5. Is the relationship between pre-sleep entrapment and awakening suicidal ideation moderated by poor sleep?	161
6.5. Discussion	162
6.6. Conclusion	167
6.7. References.....	167
CHAPTER 7	171
7. Discussion	171
7.1. Summary of key findings	171
7.2. Strengths and limitations of overarching methodological approach	177
7.2.1. Overarching strengths.	177
7.2.2. Overarching limitations.	178
7.3. Interrelationships between sleep disturbance, suicidal thoughts and behaviours and entrapment: What does this mean for theory?	180
7.3.1. Implications for the Schematic Appraisals Model of Suicide (SAMS; Johnson et al., 2008).	183
7.3.2. Implications for the Integrated Motivational-Volitional Model of Suicidal behaviour (IMV; O'Connor, 2011).	185
7.4. Clinical implications.....	186
7.4.1. Assessment of sleep disturbance.	186
7.4.2. Incorporating sleep disturbance into case formulation.	187
7.4.3. Intervention targeted at sleep disturbance and psychological factors in context of suicidal pathways.	188
7.4.3.1. Sleep interventions.....	188
7.4.3.2. Interventions targeted at related psychological factors.....	190
7.5. Future research	191
7.5.1. Clarification of the role of entrapment.	191
7.5.2. Mechanisms specific to the association between nightmares and suicidal thoughts and behaviours.	192
7.5.3. Contribution of psychosocial factors.	194
7.6. Conclusion	195
REFERENCES	196
Appendix A. MeSH terms tailored according to each electronic database.....	214
Appendix B. Assessment criteria of the methodological quality of the studies.....	215
Appendix C. Topic Guide for Chapter 4, Qualitative Interview Study.....	216

Appendix D. EMA Item list.	218
Appendix E. Pittsburgh Sleep Quality Index.....	219
Appendix F. The Sleep Condition Indicator	221
Appendix G. Brief sleep screen	222
Appendix H. Sleep Diary	223
Appendix J. Patient Health Questionnaire (PHQ-9)	227
Appendix M. Safety Protocol.....	228

Total word count = 56,462

LIST OF TABLES

Table 2.1. Overview of the empirical studies reported within this thesis.	38
Table 2.2. Overview of constructs measured within the thesis.	50
Table 3.1. Summary of studies which have examined the relationship between sleep, suicidality and psychological factors.	68
Table 4.1. Means and ranges of participant clinical characteristics.	113
Table 4.2. Overview of participant socio-demographic characteristics	114
Table 5.1. Means (with standard deviations in parenthesis), ranges and Pearson product-moment correlational coefficients for nightmares, suicide, defeat, entrapment, hopelessness, and insomnia.....	138
Table 5.2. Point estimates for indirect effects and 95% bias-corrected confidence intervals for multiple mediational analysis in which defeat, entrapment, and hopelessness were represented as mediators in the association between nightmares and suicidal behavior (controlling for insomnia)	139
Table 6.1. Descriptive statistics for pre-EMA measures of sleep, suicidal ideation, depression and anxiety.....	154
Table 6.2. Descriptive statistics for daily measures of sleep and in-the-moment measures of suicidal ideation and entrapment.	159
Table 6.3. Effect of objective and subjective sleep parameters on next-day suicidal ideation (controlling for anxiety and depression symptom severity).....	160
Table 6.4. Effect of suicidal ideation on objective and subjective sleep parameters the following night (controlling for anxiety and depression symptom severity).....	161
Table 7.1. Overview of novel findings reported in this thesis.	171

LIST OF FIGURES

<i>Figure 2.1.</i> PRO-Diary actigraphy watch (CamNtech, Cambridge, UK) used in EMA study (Chapter 6).	53
<i>Figure. 3.1.</i> PRISMA flow diagram illustrating the processes of literature searches and screening.	66
<i>Figure. 3.2.</i> Solid lines depict mediational or moderational pathways from the review findings, and dotted lines indicate additional pathways as predicted by contemporary models of suicide.	93
<i>Figure 4.1.</i> Conceptual model of beliefs about sleep and suicidal thoughts and behaviours.	115
<i>Figure 5.1.</i> Multiple mediation model for nightmares and suicidal behavior, via defeat, entrapment, and hopelessness (controlling for insomnia). Predicted mediational pathway highlighted in bold.	134
<i>Figure 5.2.</i> Multiple mediation model for nightmares and suicidal behavior, via defeat, entrapment and hopelessness (controlling for insomnia). Significant pathways highlighted in bold.	140
<i>Figure. 6.1.</i> Moderation effects of sleep quality on the relationship between pre-sleep entrapment and awakening suicidal ideation.....	162
<i>Figure 7.1.</i> Model illustrates the role of entrapment in relation to the association between nightmares and suicidal thoughts and behaviours (Chapter 5).....	181
<i>Figure 7.2.</i> Model illustrates the role of entrapment in relation to the association between poor sleep quality and suicidal thoughts and behaviours (Chapters 4 and 6).	182
<i>Figure 7.3.</i> The Schematic Appraisals Model of Suicide (Johnson et al., 2008), adapted to illustrate proposed poor sleep quality pathway.	184
<i>Figure 7.4.</i> The integrated motivational-volitional model of suicide behaviour (O'Connor, 2011), adapted to illustrate proposed nightmares, poor sleep quality pathway and nocturnal awakening.....	185

LIST OF COMMON ABBREVIATIONS

APA = American Psychiatric Association

BDI-II = Beck Depression Inventory, version II

BSSI = Beck Scale for Suicidal Ideation

CBT-I = Cognitive Behavioural Therapy for Insomnia

DSM-IV = Diagnostic and Statistical Manual of mental disorders, version IV

DSM-V = Diagnostic and Statistical Manual of mental disorders, version V

EMA = Ecological Momentary Assessment

IMV = Integrated Motivational Volitional model of suicidal behaviour

IPTS = Interpersonal Psychological Theory of Suicide

REM = Rapid Eye Movement

PHQ-9 = Patient Health Questionnaire (9-item version)

PSQI = Pittsburgh Sleep Quality Index

PTSD = Post-traumatic stress disorder

SAMS = Schematic Appraisals Model of Suicide

SCI = Sleep Condition Indicator

SE = Sleep Efficiency

SOL = Sleep Onset Latency

SQ = Sleep Quality

STAI = State Trait Anxiety Inventory

SURG = Service User Research Group

TST = Total Sleep Time

WHO = World Health Organization

ABSTRACT

Candidate: Donna Littlewood

A thesis submitted to the University of Manchester for the degree of Doctor of Philosophy in the Faculty of Biology, Medicine and Health in April, 2018.

Thesis title: Understanding the role of symptoms of sleep disturbance in suicidal pathways

Growing evidence shows an association between sleep disturbance and suicidal thoughts and behaviours. Key research questions remain regarding i) the extent to which this association exists beyond depression, ii) what are the specific symptoms of sleep disturbance which appear to drive this association, and iii) which psychological factors may account for the relationship between sleep disturbance, suicidal thoughts, and behaviours. Therefore, the first aim of this thesis was to conduct a nuanced investigation of which specific symptoms of sleep disturbance were associated with suicidal thoughts and behaviours, beyond symptoms of depression. The second aim was to examine the role of psychological factors in the relationship between symptoms of sleep disturbance and suicidal thoughts and behaviours. Consideration was given to the appropriate methodological approaches relating to research design, populations, and assessment (Chapter 2). A systematic review critically appraised research which has examined the interrelationships between psychological factors, sleep disturbance and suicidal thoughts and behaviours (Chapter 3). Findings were integrated with psychological models of suicide to develop a series of hypotheses with the potential to drive a novel and impactful research agenda. A qualitative interview study explored perceptions of the role of sleep in suicidal pathways in people ($n = 18$) with experience of a major depressive episode(s) and suicidal thoughts and/or behaviours (Chapter 4). Inductive thematic analysis showed that being awake during the night was a vulnerable time for a suicide attempt; poor sleep made it harder to manage mental wellbeing; and sleep provided an important escape from waking-life problems. The association between nightmares and suicidal behaviours was examined in existing cross-sectional data that was collected with people ($n = 91$) who had symptoms of post-traumatic stress disorder (Chapter 5). A significant relationship was found between nightmares and suicidal behaviour, independent of symptoms of insomnia. A mediational analysis showed that this relationship was partially explained by perceptions of defeat, entrapment and hopelessness. However, the direct effect between nightmares and suicidal behaviour still remained statistically significant. Chapter 6 tested hypotheses which were outlined in the systematic review, and derived from the qualitative interview study. A seven-day ecological momentary assessment study was conducted with people who were currently experiencing a major depressive episode and suicidal ideation. Using both objective and subjective assessments of sleep, multilevel models showed that poor sleep quality, and short sleep duration predicted increased suicidal ideation the next-day, but day-time suicidal ideation did not predict symptoms of sleep disturbance the subsequent evening. Moderation analyses were based on key variables derived from the qualitative study in Chapter 4. These analyses revealed that sleep quality altered the strength of relationship between pre-sleep entrapment and awakening suicidal ideation. Specifically, poor sleep quality strengthened the association between pre-sleep entrapment and suicidal ideation on waking. The implications of these findings are discussed in relation to contemporary psychological models of suicide which account for the role of entrapment in relation to suicidal pathways. Suggestions are made throughout the thesis to guide clinicians in integrating findings from the review and empirical chapters when conducting assessments, formulations and interventions with people who experience suicidal thoughts and behaviours. Key avenues for future research are outlined which seek to advance understanding of the relationship between sleep disturbance and suicidal thoughts and behaviours. These suggestions focus on i) investigation of the role of entrapment versus underlying bias of negative appraisals, ii) identification of mechanisms specific to the association between nightmares and suicidal thoughts and behaviours, and iii) examination of the contribution of psychosocial factors.

LAY ABSTRACT

Suicide is a leading cause of preventable death. Research seeks to understand the combination of factors which contribute to a person developing suicidal thoughts. One factor which is associated with suicidal thoughts and attempts is sleep disturbance. Although, not everyone who experiences sleep problems also thinks about suicide. Therefore, this research sought to understand how sleep is related to suicidal thoughts and acts, and specifically identify the other factors which contribute to the relationship between sleep disturbance and suicidal thoughts and behaviours.

In the first study, previous research findings were evaluated and considered alongside current explanations for why people have suicidal thoughts and behaviours. From this work, a series of questions were produced which should be addressed through future research.

For the second study, 18 people with experiences of depression and suicidal thoughts and/or attempts participated in interviews about their beliefs regarding the role of sleep in relation to their own experiences of suicide. Themes were identified from the interviews which indicated that: i) being awake in the night was a vulnerable time for suicidal thinking and attempts, primarily due to reduced access to support, ii) inadequate sleep negatively affected people during the day, reducing their ability to cope, control their thoughts, focus their attention and interact with others, and iii) sleep provided an escape from waking-life problems.

In the third study, the relationship between nightmares and suicidal behaviour was examined with 91 people who had symptoms of post-traumatic stress disorder. This showed that nightmares were related to suicidal behaviour, even when levels of depression and insomnia had been taken into account.

The second part of this study assessed the extent to which people felt defeated by life (defeat), trapped in their current emotional state (entrapment), and hopeless about the future (hopelessness). Part of the relationship between nightmares and suicidal behaviour was explained by feelings of defeat, entrapment and hopelessness. However, a relationship between nightmares and suicidal behaviour remained, which indicates that other factors contribute to this relationship.

Finally, the fourth study examined whether poor sleep was related to greater levels of suicidal thoughts the following day, and whether suicidal thoughts during the day would predict poor sleep the subsequent evening. In this research, 51 people with depression and suicidal thoughts took part in a 7-day study in which they completed a questionnaire each morning about how they had slept the previous night. They also wore a touch-screen watch for the duration of the study which monitored their sleep patterns, and also asked questions about suicide and other mood related factors at 6 random timepoints each day. Specifically, this study showed that short sleep duration and poor sleep quality were associated with higher levels of suicidal thoughts the next day. However, suicidal thoughts did not predict sleep problems the following night.

This study also looked at entrapment, which refers to wanting to escape from your emotional state but feeling trapped and unable to do so. In instances when people experienced high levels of entrapment before going to sleep, sleep quality was found to affect how suicidal they would feel on awakening. Those who felt they'd had a good night's sleep, had lower levels of suicidal thoughts on awakening. Whilst those who had a poor night's sleep, awoke with higher levels of suicidal thoughts.

Taken together, findings from this research project highlight the importance of assessing sleep and providing treatment to improve sleep quality and sleep duration when working with people who experience suicidal thoughts. Sources of night-time support should also be established for those who currently experience night-time awakening. Further research is needed, and should particularly focus on understanding the factors which explain the relationship between nightmares, suicidal thoughts and behaviours.

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.

Published work

This thesis is presented in journal format with four papers (Chapters 3-6). Chapters 3, 4, and 5 have been published in peer-reviewed journals, namely, *Clinical Psychology Review*, *BMJ Open* and *Journal of Clinical Sleep Medicine*. Chapter 6 has been accepted for publication by *Psychological Medicine*. References for the published papers are included within each of the chapters. Figures and tables have been placed within the main body of the text and renumbered to aid the wider comprehension of this thesis.

Authorship and collaboration

The author was responsible for the design, delivery, data analysis and write up of the research presented within this thesis, with support from PhD supervisors of Dr Patricia Gooding (primary supervisor), Dr Simon Kyle, Dr Sarah Peters, and Dr Daniel Pratt. Therefore they are included as co-authors on the papers included in Chapters 3-6. Recruitment and data collection for Chapters 4 and 6 were conducted solely by the author. Chapter 5 features a secondary analysis of an existing dataset, which was collected by Dr Maria Panagioti, who is recognised as a co-author. Data analysis in Chapter 6 was conducted by the author of this thesis, under the guidance of Dr Lesley-Anne Carter. Therefore, she is included as a co-author of the paper presented in Chapter 6.

COPYRIGHT STATEMENT

- I. 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.

DEDICATION

I dedicate the work presented in this thesis to the people who participated in this research. In sharing your experiences and insight with me, you have enabled us to develop a deeper understanding, which I hope will subsequently help to improve mental wellbeing for others.

On a personal note, your stories have stayed with me. They continue to motivate me, not only in my research to help prevent self-harm and suicide, but also to ensure I encourage others to talk openly about suicide. Finally, I want to share a picture from one of the people who supported this research, because as the saying goes, a picture speaks a thousand words.



ACKNOWLEDGEMENTS

First, thank you to the funders, the Medical Research Council and The University of Manchester President's Doctoral Scholarship. During my PhD, I have been fortunate enough to have the support of a stellar supervisory team, Dr Patricia Gooding, Dr Sarah Peters, Dr Simon Kyle and Dr Daniel Pratt. Trish, thank you for your unwavering encouragement, thorough feedback and creativity in finding a solution to any given problem. Sarah, thank you for safeguarding my sanity and encouraging the development of my qualitative research skills. Simon, I will forever be in awe of your (almost) photographic memory. Thank you for your tutelage in the vast world of sleep research. Dan, thank you for providing clinical insight and for spending the time to talk following difficult research interviews. Additional thanks to Dr Lesley-Anne Carter for providing her statistical expertise to support the ecological momentary assessment study reported in Chapter 6, and to Dr Maria Panagioti for her support on the cross-sectional study reported in Chapter 5.

My PhD life was made infinitely better by a whole host of people. To those who were a few steps ahead, Drs. Becky Owen, Lindsey Dewa and Natalie Berry, thank you for sharing your wisdom and providing pep talks with wine. To my fellow suicide and self-harm researchers who collectively make up NetECR, you are the best virtual lab anyone could wish for. In particular, Emma Nielsen, Tiago Zortea, Kirsten Russell, Hayley Gorton and Laura Hemming, thank you for the insightful discussions about the field, and waxing lyrical about how we can work to make a difference. Emma, the flask is in the post. Thanks to the best office mate, Currie Moore, and I am sorry for dropping the baton on the treats front on many occasions. To my public engagement pals, Kirsty McIntyre, Mike Daniels, Jack Barton and Katie Fairweather- here's to fighting the good fight. Thanks for providing a great source of external activity and a welcome break from the PhD.

Finally, a huge thank you to my family and friends for your incessant support. Mum and Dad, thanks for listening to me talk endlessly about my work and celebrating my successes. To my brother Chris, as you often remind me, you're my inspiration. Mark, thank you for being with me every step of the way, for the highs and especially during the lows. My best team mate! I'm so very lucky to have you all.

CHAPTER 1.

1. Introduction

This chapter provides an introduction to the key concepts examined within this thesis, namely, suicidal thoughts and behaviours, sleep disturbance, and psychological factors. Rationale is outlined for the thesis which focuses on the role of sleep disturbance within suicidal pathways. The chapter concludes with an overview of the overarching aims of the thesis.

1.1. Suicide

Each year approximately 804,000 people die from suicide (World Health Organization [WHO], 2014). The latest published figures in the UK show that 5,965 people died by suicide in 2016 (Office for National Statistics, 2017). The impact of this loss of life is profound, with those bereaved by suicide at a greater risk of depression (Séguin, Lesage, & Kiely, 1995), substance abuse (Brent, Melhem, Donohoe, & Walker, 2009), and suicidal behaviours (Pitman, Osborn, Rantell, & King, 2016). In addition to those who die by suicide, data from 84,850 adults collected across 17 countries suggests that 9.2% of people will experience suicidal thoughts, and 2.7% will attempt suicide (Nock et al., 2008). Furthermore, previous history of suicidal behaviours or self-harm constitutes one of the greatest predictors of suicide (NCISH, 2017; Rihmer & Dome, 2016). Therefore, research should seek to understand factors that contribute to the development and maintenance of suicidal thoughts and behaviours, which can then be used to develop effective interventions to prevent suicide (G. K. Brown, Beck, Steer, & Grisham, 2000). The identification of risk factors that can be effectively modified may provide suitable targets for prevention efforts.

Currently, the operationalisation of suicidal thoughts and behaviours within research adopts a diverse range of terminology (Silverman, 2016). In lieu of an agreed nomenclature amongst suicide researchers, the current thesis generally makes reference to

suicidal thoughts or ideation (includes feeling, wishing or thinking about endings one's life), suicidal behaviours (self-harming behaviours with suicidal intent), and suicidality (suicidal thoughts and behaviours). Where questionnaire measures have been used to assess suicide-related phenomena, then terminology is consistent with that specified by the original authors.

More broadly, the ability to distinguish acts of self-harm on the basis of suicidal intent has been debated (e.g., Butler & Malone, 2013; Kapur, Cooper, O'Connor, & Hawton, 2013). 'Self-harm' has been conceptualised as acts of self-injury or poisoning, irrespective of motivation, i.e., presence or absence of suicidal intent (Hawton et al., 2007). In contrast, the term non-suicidal self-injury (NSSI) has been adopted in studies that seek to differentiate intentional acts of self-injury based on the absence (i.e., NSSI) or presence of suicidal intent (i.e., suicidal behaviour or attempt). Although there is substantial overlap in risk factors across acts of self-harm, differences have been identified in the strength of the association between some risk factors for NSSI, in comparison to suicidal behaviours (e.g., Mars et al., 2014). In reflection of this, the current thesis focuses on 'suicidal behaviour' opposed to the broader concept of 'self-harm.'

1.1.1. Factors associated with suicidal thoughts, behaviours and death by suicide.

Key to preventing suicide is understanding the combination of factors that lead an individual to think about, plan and take action to end their own life. Research has identified sociodemographic, environmental and psychological factors that are associated with suicidal thoughts and behaviours (Bernal et al., 2007; Nock et al., 2008; O'Connor & Nock, 2014). Sociodemographic risk factors can vary between countries. Men generally have higher rates of death by suicide than women, with increased gender differences in high-income countries in comparison to lower or middle income countries (WHO, 2014). Globally, those who are aged 70 years or above are at greatest risk for suicide (WHO, 2014), although western countries such as the UK and US also report increased rates

amongst those aged 40-54 years (Centers for Disease Control and Prevention, 2017; Office for National Statistics, 2017). Epidemiological research has also examined the combination of sociodemographic and environmental factors in relation to suicide. For example, higher rates of suicide were identified amongst working-age men in countries which had increased unemployment following the ‘global economic crisis’ in 2008, in comparison to rates in 2007 (Chang, Stuckler, Yip, & Gunnell, 2013).

The link between mental health problems and suicide has been subject to extensive research, with substantially higher rates of suicide reported amongst individuals with diagnoses of depression, bipolar disorder, schizophrenia, substance use or borderline personality disorder, in comparison to the general population (Chesney, Goodwin, & Fazel, 2014). Psychological autopsy is commonly utilised to assess mental health problems in relation to suicide (Cavanagh, Carson, Sharpe, & Lawrie, 2003). This assumes that valid and reliable diagnoses of a mental health problem can be made based on the testimony of the deceased persons family and friends (Hjelmeland, Dieserud, Dyregrov, Knizek, & Leenaars, 2012). However, findings from research using other types of methodology also point to a relationship between mental health problems and suicide. In the UK, 28% of people who died by suicide had contacted mental health services in the past 12 months (NCISH, 2017). Data from 21 countries collected by the World Health Organization showed that mental health problems were associated with an increased likelihood of experiencing suicidal ideation, plans and behaviours (Nock et al., 2009). Furthermore, suicidal thoughts and behaviours also feature in the diagnostic criteria for major depression (American Psychiatric Association [APA], 2013).

Depressive disorders are one of the most common mental health problems, with an estimated 300 million people worldwide affected by depression (WHO, 2017). Given the prevalence of depression, it is important to understand the factors that contribute to the development of suicidal thoughts and behaviours when a person is depressed. A major depressive episode is characterised by a persistent depressed mood and/or a loss of interest

or pleasure in activities, which has lasted for at least two weeks (APA, 2013). Other symptoms of a major depressive episode include sleep disturbance, reduced energy, decreased activity or feelings of fatigue, and feelings of guilt or worthlessness (APA, 2013). Data from a national prospective study in Denmark estimated that lifetime risk of suicide was 3.8% for women diagnosed with unipolar depression and 6.7% for men diagnosed with unipolar depression (Nordentoft & Mortensen, 2011). Further research has highlighted factors that predict suicide in people who have experienced major depressive disorders, such as a history of suicidal behaviour (OR = 4.84, 95% CI = 3.26 – 7.20) (Hawton, i Comabella, Haw, & Saunders, 2013). Notably, sociodemographic factors such as gender or employment status do not appear to have as strong association to suicide in people with depressive disorders (Lin, Lee, Kuo, & Chu, 2008; McGirr, Renaud, Seguin, Alda, & Turecki, 2008; Sinclair, Harriss, Baldwin, & King, 2005; Valenstein et al., 2008). For instance, nine studies that examined the relationship between gender and suicide in people with depression, showed that men had a higher odds ratio for suicide than women (OR= 1.76, 95% CI = 1.08 – 2.86) (Hawton et al., 2013). However, this is somewhat lower than the global male-to-female ratio for suicide deaths which is 2.8 (WHO, 2014).

It is important to note that risk factors such as mental health problems offer little clinical utility to effectively predict future suicidal behaviours (Franklin et al., 2017). Suicidal behaviours are likely to stem from a combination of multiple factors, operating across different timeframes (Franklin et al., 2017). Therefore, it would be ineffective to base suicide prevention efforts solely on sociodemographic or clinical risk factors.

To conclude, this body of research is useful for identifying broad factors that are associated with greater risk of suicide. In addition to understanding population level risk factors for suicide, research should also seek to understand the factors and processes that lead an individual to develop suicidal thoughts and behaviours.

1.1.2. Psychological models of suicidal thoughts and behaviours.

Psychological models of suicide seek to explain how psychological factors and processes interact with increased vulnerability from sociodemographic and clinical risk factors, in the development of suicidal thoughts and behaviours (Johnson, Gooding, & Tarrier, 2008; O'Connor & Nock, 2014). Different models of suicidal behaviour provide varied accounts on the specific psychological processes that contribute to suicidal pathways (O'Connor & Nock, 2014). However, the concepts of '*defeat*' and '*entrapment*' have been emphasised by numerous psychological theories of suicide (Baumeister, 1990; Johnson et al., 2008; O'Connor, 2011; Williams, 1997; Williams, Crane, Barnhofer, & Duggan, 2005). Defeat refers to the sense of being powerlessness as a consequence of a failed struggle (Gilbert & Allan, 1998). Entrapment represents the desire to escape, combined with the belief that escape is prevented (Gilbert & Allan, 1998). These concepts stem from an evolutionary theory of depression, and have since been adopted across theoretical models of suicide, such as The Cry of Pain (Williams, 1997; Williams et al., 2005), the Schematic Appraisals Model of Suicide (SAMS; Johnson et al., 2008) and the Integrated Motivational Volitional model of suicidal behaviour (IMV; O'Connor, 2011). Although these models are comprised of differing additional elements, they all place perceptions of defeat and entrapment as central to the development of suicidal thoughts and behaviours. Broadly, suicidal thinking is explained as resulting from a sense of defeat, which is perceived to be inescapable. Empirically, a systematic review (Taylor, Gooding, Wood, & Tarrier, 2011) and meta-analysis (Siddaway, Taylor, Wood, & Schulz, 2015) reported significant associations between defeat and entrapment and suicidal thoughts in a range of clinical and non-clinical samples. However, results from the few prospective studies in this area are mixed (Ng, Di Simplicio, McManus, Kennerley, & Holmes, 2016; O'Connor, Smyth, Ferguson, Ryan, & Williams, 2013; Owen, Dempsey, Jones, & Gooding, 2018; Slade, Edelmann, Worrall, & Bray, 2014).

The aforementioned theories of suicide also identify differences in thinking about the future, which have been described as ‘*hopelessness*’ in the Cry of Pain (Williams, 1997; Williams et al., 2005) and the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010), ‘*negative appraisals about the future*’ in the SAMS (Johnson et al., 2008) and as ‘*impaired positive future thinking*’ in the IMV (O'Connor, 2011). Hopelessness can be conceptualised as pessimism about the future (Beck, Weissman, Lester, & Trexler, 1974). Generally, across these models of suicide, perceptions of hopelessness are fundamental to the development of suicidal thoughts, desire and intent (Johnson et al., 2008; Joiner, 2005; O'Connor, 2011; Van Orden et al., 2010; Williams, 1997; Williams et al., 2005). Extensive research has shown that hopelessness predicts suicidal thoughts, behaviours, and death by suicide (Brezo, Paris, & Turecki, 2006; McMillan, Gilbody, Beresford, & Neilly, 2007).

More recently, three psychological theories have sought to provide an explicit account of the process by which individuals develop suicidal ideation, and then progress from ideation to suicidal behaviours (Joiner, 2005; Klonsky & May, 2015; O'Connor, 2011; Van Orden et al., 2010). This is important given that most people who think about suicide will not attempt suicide (McManus, Bebbington, Jenkins, & Brugha, 2016; Nock et al., 2008). These models are the IMV (O'Connor, 2011), the IPTS (Joiner, 2005; Van Orden et al., 2010), and the three step theory (Klonsky & May, 2015). All three theories emphasise the development of an ‘*acquired capability*’ for suicidal behaviour, which then enables the individual to act on their suicidal intent or desire. Joiner (2005) theorised that individuals acquire the capability for suicidal behaviour through developing an increased pain tolerance and reduced fear of death. Practical factors also contribute to the capability for suicidal behaviour, such as possessing the knowledge of suicide methods and access to means to carry out suicidal behaviour (Klonsky & May, 2015; O'Connor, 2011). Factors thought to contribute to capability for suicide behaviour (e.g., fearlessness about death) have been shown to differentiate between people who have a history of suicidal ideation

without behaviour from those with a history of suicidal behaviour (Dhingra, Boduszek, & O'Connor, 2015; Klonsky & May, 2015; Smith, Cukrowicz, Poindexter, Hobson, & Cohen, 2010). However, other studies have failed to replicate these findings (Baertschi et al., 2017; Heelis, Graham, & Jackson, 2016). May and Victor (2018) provide further discussion of the evidence base for capability for suicide and suggest avenues for future research.

1.2. Sleep disturbance

Having briefly outlined some of the sociodemographic and clinical factors associated with suicidal thoughts and behaviours (section 1.1.1), this thesis will focus specifically on sleep disturbance, which can be considered a modifiable risk factor for suicidal thoughts, attempts and death by suicide (Malik et al., 2014; Pigeon, Pinquart, & Conner, 2012).

Sleep plays an important role in the maintenance and restoration of the brain and body (Buysse, 2014). Consequently, even short-periods of sleep loss can negatively affect functioning, such as cognitive deficits in memory and decision-making processes (Lim & Dinges, 2010). Furthermore, longer-term periods of inadequate sleep are related to physical health problems, such as increased risk of obesity (Cappuccio et al., 2008), cardiovascular disease (Ikehara et al., 2009), and type 2 diabetes (Cappuccio, D'elia, Strazzullo, & Miller, 2010). Also, research has recently shown a bi-directional relationship between sleep, and emotional regulation and processing (Kahn, Sheppes, & Sadeh, 2013). It is possible that this may partially account for the high incidence of sleep disturbance reported by people with mental health problems (Baglioni et al., 2016; Roth & Drake, 2006; Tsuno, Besset, & Ritchie, 2005).

Symptoms of sleep disturbance are related to the onset and course of mental health problems (Baglioni, Battagliese, et al., 2011; Dolsen, Asarnow, & Harvey, 2014). For instance, sleep problems have been identified as one of the most commonly reported

residual symptoms of depression (Nierenberg et al., 2010; van Mill, Hoogendijk, Vogelzangs, van Dyck, & Penninx, 2010). However, sleep disturbance can be effectively treated using pharmacological and psychological interventions (Casement & Swanson, 2012; Smith et al., 2002; Taylor & Pruiksma, 2014). There is also preliminary evidence to suggest that people are more likely to seek help from health professionals in relation to sleep disturbance than for other symptoms of mental health problems, such as hopelessness (Hom et al., 2016). Thus, it is possible that help-seeking for sleep disturbance could act as an entry point to engage individuals in assessment and treatment of other symptoms of mental health problems.

Common symptoms of sleep disturbance include difficulty falling asleep, difficulty maintaining sleep, nocturnal awakenings and impaired daytime functioning. The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) (APA, 2013) includes 10 categories of sleep disorders: insomnia disorders, hypersomnolence disorder, nightmare disorder, narcolepsy, breathing-related sleep disorders, circadian rhythm sleep-wake disorders, non-rapid eye movement sleep arousal disorders, rapid eye movement sleep behaviour disorder, restless legs syndrome and substance/medication-induced sleep disorder. Insomnia is particularly prevalent across people with mental health problems (Baglioni et al., 2016), such as depression, in which 40-71% of individuals experience symptoms of insomnia (Pigeon, 2010). Insomnia is characterised by difficulty falling asleep and/or difficulty maintaining sleep with compromised daytime functioning, across a period of four weeks or longer (APA, 2013). Previously, when insomnia was experienced in the context of depression it was conceptualised more as a symptom of depression, rather than as a co-morbid disorder (Riemann, Berger, & Voderholzer, 2001). However, research findings challenge this conception, through evidence that symptoms of insomnia significantly predict the subsequent onset of first episode, or recurrent episodes of depression (Franzen & Buysse, 2008).

1.2.1. Sleep disturbance as a transdiagnostic process in mental health.

Sleep disturbance has been proposed as a transdiagnostic process in mental health problems (Dolsen et al., 2014; Fairholme et al., 2013; Harvey, Murray, Chandler, & Soehner, 2011). This proposition is supported by four lines of evidence. First, sleep is considered integral to mood regulation and cognitive functioning (Fortier-Brochu, Beaulieu-Bonneau, Ivers, & Morin, 2012; Walker, 2009), both of which are commonly compromised during periods of poor mental health (Berking & Wupperman, 2012; Gotlib & Joormann, 2010; Marazziti, Consoli, Picchetti, Carlini, & Faravelli, 2010). Second, sleep disturbance features in the DSM-V and ICD-10 diagnostic criteria for different types of mental health problems including depression, bipolar disorder, anxiety disorders, post-traumatic stress disorder (PTSD), and schizophrenia (APA, 2013; WHO, 1992). Third, results from a recent meta-analysis showed that Cognitive Behavioural Therapy for Insomnia (CBT-I) produces positive outcomes in relation to symptoms of sleep disturbance, and also in comorbid symptoms of depression and PTSD (Wu, Appleman, Salazar, & Ong, 2015). Finally, mental health problems and sleep disturbance are linked to the same neurobiological processes, including those reliant on serotonin and dopamine systems (Harvey et al., 2011).

1.3. The relationship between sleep disturbance, suicidal thoughts and acts

Investigation of the links between sleep disturbance and suicidal thoughts and behaviours has explored a wide range of sleep-related constructs, which can broadly be grouped into three types: i) global assessments of sleep disturbance, ii) types of sleep disorders or problems (e.g., insomnia), and iii) specific parameters of sleep (e.g. total sleep time). The assessment of interrelationships with mental health problems constitutes a key methodological issue for work in this area. Symptoms of sleep disturbance predict the onset and recurrence of mental health problems (Baglioni, Battagliese, et al., 2011; Cho et al., 2008). Furthermore, people with mental health problems have a higher incidence of death by suicide than in comparison with the general population (Chesney et al., 2014).

Therefore, it is important to understand the extent to which sleep disturbance is related to suicidal thoughts and behaviours, beyond the interrelationships with mental health problems. In quantitative research this can be examined through statistically accounting for comorbid mental health problems.

In this thesis, primary focus will be given to understanding the association between sleep disturbance and suicidal thoughts and behaviour in relation to depression. People with depression experience both a high incidence of sleep disturbance (Tsuno et al., 2005; Pigeon, 2010) and suicidal thoughts and behaviours (Harris & Barraclough, 1997; Rihmer & Dome, 2016). Thus, it is important to understand how sleep disturbance commonly experienced by people with depression, may contribute to their vulnerability for suicidal thoughts and behaviours.

1.3.1. Sleep disturbance associated with suicidal thoughts and behaviours.

Studies investigating the association between sleep and suicidal thoughts and behaviours, have used the term ‘sleep disturbance’ to demark the presence of symptoms of sleep problems and/or perceptions of poor sleep quality (e.g., Agargun, Kara, & Solmaz, 1997a; Bernert, Turvey, Conwell, & Joiner, 2014; Pigeon, Britton, Ilgen, Chapman, & Conner, 2012). Beyond reporting a general cross-sectional association between sleep disturbance and suicidal thoughts and behaviours (Pigeon, Pinquart, et al., 2012), sleep disturbance has also been highlighted as a more proximal risk factor for suicide attempts and death by suicide. Baseline sleep problems predicted suicide attempt at one-month follow-up, after controlling for baseline depression and hopelessness (Ribeiro et al., 2012). Analysis of the medical records of 157 people who had died by suicide showed that 76% had reported sleep problems in the 30 days prior to suicide (Berman, 2017). In addition, sleep disturbance was shown to be a predictor of poorer outcomes following a stay on a psychiatric inpatient unit (Nadorff, Ellis, Allen, Winer, & Herrera, 2014). For instance, failure to improve sleep disturbance during inpatient treatment predicted higher levels of

suicidal ideation at discharge, independent of levels of sleep disturbance, depression and suicidal ideation at admission to the unit (Nadorff, Ellis, et al., 2014).

Sleep quality is often operationalised as a global rating of subjective sleep disturbance. Indeed, research has shown that people make judgements about their sleep quality based upon three factors, namely, their total sleep duration, how refreshed they feel on waking, and how their mood is the following day (Ramlee, Sanborn, & Tang, 2017). Furthermore, sleep quality is commonly assessed with the Pittsburgh Sleep Quality Index, in which seven parameters of sleep are summed to provide the global score (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). An association between sleep quality and suicidal thoughts and behaviours has been reported by numerous cross-sectional studies (e.g., Gelaye et al., 2017; Krakow, Ribeiro, Ulibarri, Krakow, & Joiner, 2011; Lai et al., 2014; Lapierre et al., 2012; Smith, Perlis, & Haythornthwaite, 2004). However, only one of these studies statistically controlled for comorbid depression (Krakow et al., 2011). Importantly, this association has since been corroborated by a prospective, epidemiological study by Bernert et al. (2014). Poor sleep quality at baseline was associated with increased risk of death by suicide during the 10-year follow-up period, after controlling for baseline depression (Bernert et al., 2014).

1.3.2. Sleep disorders associated with suicidal ideation and behaviours.

Suicidal thoughts and behaviours have been linked to symptoms of a range of sleep disorders such as insomnia, nightmares, and sleep-related breathing disorders (Malik et al., 2014). The majority of research has focused on insomnia or nightmares. This is understandable, given that insomnia is highly prevalent across people with mental health problems (Sivertsen, Krokstad, Øverland & Mykletun, 2009). Nightmares are also commonly reported by people with mental health problems (Sheaves, Onwumere, Keen, Stahl, & Kuipers, 2015; Spoormaker, Schredl, & van den Bout, 2006) with particularly high prevalence in those with PTSD (Hasler & Germain, 2009).

The early research in this area relied on composite measures of insomnia by extracting one or two items from larger scales, which generally were designed to examine depression (e.g., Agargun et al., 1997a; Ribeiro et al., 2012). Such operationalisation of insomnia is likely to lack specificity, and instead will provide a more general assessment of symptoms of sleep disturbance. However, there is now a growing body of literature that has assessed the relationship between insomnia and suicidal thoughts and behaviours using validated scales, such as the Insomnia Severity Index (e.g., Bernert, Joiner, Cukrowicz, Schmidt, & Krakow, 2005; Cukrowicz et al., 2006; McCall et al., 2010; Nadorff, Nazem, & Fiske, 2011; Zuromski, Cero, & Witte, 2017). When considering this specific evidence base, there is inconsistent support for the association between insomnia and suicidal thoughts and behaviours, after adjusting for depression. Three cross-sectional studies found no significant relationship between insomnia and suicidal ideation, when symptoms of depression were included within analyses as a control variable (Bernert et al., 2005; Cukrowicz et al., 2006; Nadorff et al., 2011). In contrast, three longitudinal studies reported that insomnia was significantly associated with suicidal thoughts (McCall et al., 2010; Zuromski et al., 2017), and suicidal attempts (Li et al., 2016), independent of depressive symptoms.

Depression has also been examined as a specific mediator of the relationship between sleep disturbance and suicidal ideation and behaviours. Depression was reported to mediate the concurrent association between insomnia and suicidal ideation in four studies with different clinical samples (Bryan et al., 2015; Nadorff, Fiske, Sperry, Petts, & Gregg, 2013). In addition, depression was also shown to mediate the association between insomnia symptoms at baseline, and suicidal ideation at 12-month follow-up (Allan et al., 2017; Bryan et al., 2015). However, one study reported divergent findings when they examined suicidal behaviours rather than suicidal ideation as the outcome variable. Here the direct association between baseline insomnia and suicidal behaviour at 12-month follow-up remained statistically significant (Allan et al., 2017).

Nightmares can be defined as emotionally distressing and/or frightening dreams that cause the individual to wake up (Levin & Nielsen, 2007). Whilst up to 85% of the general population report occasional nightmares (Nielsen & Levin, 2009), frequent nightmares are less common. Population based studies estimate that between 2.4% - 5.1% of the general population experience nightmares at least once a week (Hublin, Kaprio, Partinen, & Koskenvuo, 1999; Li, Zhang, Li, & Wing, 2010; Schredl, 2010). Nightmares are particularly prevalent amongst people with mental health problems, in comparison to non-clinical populations (Sheaves et al., 2015; Spoormaker et al., 2006). Cross-sectional and prospective studies have examined the association between nightmares and suicidal thoughts and behaviours in both clinical and general populations (Krakow et al., 2011; Lai et al., 2014; Sandman et al., 2017; Sjostrom, Hetta, & Waern, 2009; Tanskanen et al., 2001). In a large prospective population-based study of 36,211 people, those who reported occasional or frequent nightmares were 57% and 105% more likely to have died by suicide, in comparison to those without nightmares (Tanskanen et al., 2001). Notably, this study statistically controlled for a number of confounding variables, including symptoms of insomnia, depressed mood, and anxiety. In addition to the presence of nightmares, preliminary research also indicates that chronic nightmares may be related to suicidal thoughts and behaviours (Nadorff, Nazem, & Fiske, 2013; Sjostrom et al., 2009) .

Explanations for the difference in findings between insomnia and nightmares in relation to suicide is currently unclear. Further research is needed to provide a more nuanced investigation of specific symptoms of sleep disorders in relation to suicidal thoughts and behaviours, whilst accounting for comorbid depression. Such research should clarify whether core symptoms of sleep problems (e.g., short sleep duration or nocturnal awakening) account for the association with suicidal thoughts and behaviours, or whether specific symptoms such as nightmares also maintain an independent association with suicidal thoughts and behaviours.

1.3.3. Specific parameters of sleep associated with suicidal ideation and behaviours.

Research has used self-report, subjective measures of sleep to pinpoint the specific parameters of sleep that are associated with suicidal thoughts and behaviours. In recent years, convergent evidence has shown that short sleep duration is associated with greater levels of suicidal ideation (Ferentinos et al., 2016; Goodwin & Marusic, 2008; Gunnell, Chang, Tsai, Tsao, & Wen, 2013; Michaels, Balthrop, Nadorff, & Joiner, 2017; Qian, Sun, Zhou, Ge, & Zhang, 2017; Winsler, Deutsch, Vorona, Payne, & Szklo-Coxe, 2015). In addition, cross-sectional (Michaels et al., 2017), and epidemiological (Gunnell et al., 2013) research has also reported a statistically significant relationship between long sleep duration and increased risk of suicidal ideation and behaviours. Poor sleep efficiency and increased sleep onset latency have also been linked to suicidality (Agargun, Kara, & Solmaz, 1997b; Chakravorty et al., 2014; Gelaye et al., 2017; Pederson & Brook, 2017; Qian et al., 2017). However, only two of these studies statistically controlled for comorbid mental health problems (Chakravorty et al., 2014; Qian et al., 2017). A further limitation of research that has examined subjective parameters of sleep in relation to suicide, is that the majority of work has used cross-sectional designs, which cannot examine temporal precedence between sleep disturbance and suicidal ideation (e.g., Gelaye et al., 2017; Qian et al., 2017; Winsler et al., 2015).

In comparison, fewer studies have used objective assessment to measure sleep in relation to suicidal thoughts and behaviours. Electroencephalography and polysomnography have highlighted differences in physiological stages of sleep (e.g. slow-wave sleep), and parameters of sleep (e.g. total sleep time), in relation to suicidal thoughts and behaviours. Abnormalities in both the rapid-eye movement (REM) stage of sleep and during slow-wave sleep have been reported in people with experience of suicidal thoughts and behaviours (Agargun & Cartwright, 2003; Ballard et al., 2016; Bernert et al., 2017; Keshavan et al., 1994; Sabo, Reynolds, Kupfer, & Berman, 1991). However, there are

mixed findings pertaining to the specific nature of these abnormalities. REM sleep is thought to serve a homeostatic function that contributes to the maintenance of effective emotional reactivity (Goldstein & Walker, 2014). In two separate studies of people with current major depression, greater REM activity was reported by those with current suicidal thoughts (Agargun & Cartwright, 2003) and by people who had previously attempted suicide (Sabo et al., 1991). However, two more recent studies in people with treatment resistant depression, reported no association between differences in REM sleep and current suicidal ideation (Ballard et al., 2016; Bernert et al., 2017). It is noteworthy that the earlier two studies failed to adjust for severity of depression in their statistical analyses (Agargun & Cartwright, 2003; Sabo et al., 1991). Given that increased REM density is associated with depression (Pillai, Kalmbach, & Ciesla, 2011), it is possible that REM abnormalities were related to other depressive symptoms, rather than suicidal thoughts and behaviours.

Similarly, there is inconsistent evidence relating to the presentation of slow-wave sleep in relation to suicide. Slow-wave sleep is also believed to have a homeostatic function (Tononi & Cirelli, 2006), and has been linked to cognitive processing (Lowe, Safati, & Hall, 2017). Two studies have shown reduced slow-wave sleep in people with current suicidal ideation (Bernert et al., 2017) or a history of suicide attempts (Sabo et al., 1991). However, Agargun and Cartwright (2003) found no statistically significant differences in slow-wave sleep in a comparison of people with and without suicidal ideation.

There is evidence from objective assessment of sleep which showed that suicidal thoughts and attempts were linked to increased sleep onset latency (Sabo et al., 1991), lower sleep efficiency (Ballard et al., 2016; Bernert et al., 2017; Sabo et al., 1991), and greater wakefulness after sleep onset (Ballard et al., 2016; Bernert et al., 2017). On commencement of this thesis, the wider literature indicated that people were at greater risk of suicide during daytime hours (Perlis, Grandner, Chakravorty, et al., 2016). This has

since been refuted by a body of work that has examined nocturnal awakening in relation to suicidal thoughts and behaviours (see Chapter 4 and Chapter 7.1.).

To summarise, preliminary research indicates that there are specific sleep parameters which are related to suicidal thoughts and behaviours. There are convergent findings in some areas that have used both objective and subjective assessments of sleep in relation to suicidal thoughts and behaviours. However, there are methodological limitations relating to the preponderance of cross-sectional research designs. This prevents interpretation of possible temporal associations between sleep disturbance and suicidal thoughts and behaviours. In addition, some studies in this area have failed to statistically account for comorbid depression. Consequently, further research is needed to investigate the nuanced relationships between specific sleep parameters and suicidal thoughts and behaviours. Such studies should use temporal designs, objective and subjective measures of sleep, and adequately control for symptoms of depression.

1.4. The role of psychological factors in the relationship between sleep disturbance suicidal thoughts and acts

Although sleep disturbance is a risk factor for suicide, differences in prevalence estimates between sleep disturbance and suicidal thoughts, indicates that not everyone who has sleep problems experiences suicidal thoughts (Nock et al., 2008; Sivertsen et al., 2009). Therefore, it is important to examine the factors and processes that may account for the relationship between sleep disturbance and suicidal thoughts and behaviours. As described earlier in this chapter, sleep disturbance and mental health problems are linked to the same psychological processes and biological systems (see section 1.2.1.). Suicide is a complex behaviour, that is thought to occur from an interplay of multiple factors (O'Connor & Nock, 2014). Psychological factors and processes can illustrate how these different factors interact to produce suicidal thoughts and behaviours (Tarrier et al., 2013). Consequently, this thesis will focus on investigation of the role of *psychological factors and processes*, to further understanding of the association between sleep disturbance and

suicidal thoughts and behaviours. 'Psychological factors' will be used to refer to cognitive, social, emotional and personality factors and processes. On instigation of this thesis, no psychological model provided an explicit, testable account of the relationship between sleep disturbance and suicide. Furthermore, only five studies had examined the impact of psychological factors in relation to the association between sleep disturbance and suicidal thoughts and behaviour (Golding, Nadorff, Winer, & Ward, 2015; Nadorff, Anestis, Nazem, Harris, & Winer, 2014; Winsler et al., 2015; Woosley, Lichstein, Taylor, Riedel, & Bush, 2014). Therefore, the psychological factors investigated within this thesis were driven both inductively, by participant insight (see Chapters 4 and 6), and deductively, based on application of existing contemporary psychological models of suicidal thoughts and behaviours (see Chapter 5). Section 1.1.2. outlined the prominence of defeat, entrapment and hopelessness in theoretical accounts of suicidal thoughts and behaviours. On commencement of this thesis, no published study had examined the role of defeat and entrapment in relation to the association between sleep disturbance and suicidal thoughts and behaviours. However, three studies in this area had examined the role of hopelessness, with conflicting results. Ribeiro and colleagues (2012) reported that symptoms of sleep problems at baseline predicted suicide attempt at one month follow-up, independent of baseline levels of hopelessness. These findings are limited by the poor measurement of sleep disturbance, which was comprised of three items from broader scales that assessed depression and probability of suicidal behaviours. McCall and colleagues (2013) reported a significant association between hopelessness and suicidal ideation, but found no significant correlation between hopelessness and validated scale measures of insomnia and nightmares. Finally, a cross-sectional study with sleep diary data, and single item measures of hopelessness and suicidal ideation, showed that hopelessness mediated the association between insomnia and suicidal ideation, after controlling for symptoms of depression (Woosley et al., 2014).

In sum, further research should investigate the psychological factors and processes that contribute to the association between sleep disturbance and suicidal thoughts and behaviours. Such investigation is a vital first step, prior to conducting research which is designed to test causal pathways, and subsequently develop targeted interventions.

1.5. Overarching thesis aims

The current thesis has two overarching aims. The first aim is to provide a more nuanced understanding of the association between sleep disturbance and suicidal thoughts and behaviours, in people with experience of depression. The second aim of this PhD thesis is to develop theoretical understanding of the psychological factors and processes that underpin the relationship between sleep disturbance and suicidal thoughts and behaviours. These aims are addressed by a systematic review, qualitative interview study, cross-sectional study and ecological momentary-assessment study (Chapter 3–6).

1.5.1. Specific aims to be addressed by systematic review and empirical chapters.

The systematic review aims to appraise the empirical evidence that has examined interrelationships between sleep disturbance, suicidal thoughts and behaviours and psychological factors (see Chapter 3). Review findings are subsequently integrated with psychological theories of suicide in order to develop testable hypotheses ripe for future investigation. Chapter 4 examines individual's perceptions of the role of sleep disturbance in relation to suicidal thoughts and behaviours, with the aim of developing a conceptual model to illustrate the perceived role of sleep in suicidal pathways. The cross-sectional study seeks to investigate the association between nightmares and suicidal behaviours (Chapter 5). Here, a theoretically-informed mediational pathway is tested, whereby the association between nightmares and suicidal behaviour is predicted to function indirectly through perceptions of defeat, entrapment and hopelessness, independent of comorbid symptoms of insomnia and depression. Chapter 6 aims to examine specific pathways

depicted in Chapters 3 and Chapter 4, using a repeated assessment design. Specifically, main analyses seek to investigate the bi-directional associations between specific symptoms of sleep disturbance and suicidal ideation, after controlling for depression and anxiety symptom severity. Additional moderation analyses test the prediction that symptoms of sleep disturbance will moderate the relationship between pre-sleep entrapment and awakening levels of suicidal ideation.

CHAPTER 2.

2. Methodological Considerations

This chapter provides a critical evaluation of the rationale behind the overarching methodological decisions related to this thesis. Specifically, rationale is outlined regarding i) the involvement of a service user research group, ii) adoption of a mixed methodological approach, iii) studied population, iv) choice of research designs, v) types of analyses and vi) measurement of key constructs. Safety of participants is a paramount issue in suicide research (Lakeman & Fitzgerald, 2009a, 2009b) and an overview of the safety protocol is provided that guided the author throughout the empirical work. Greater detail regarding the specific methodologies used within this thesis are included in the individual study chapters (3-6).

2.1. Rationale for the involvement of a service user research group

Five people with lived experience of depression and suicidal thoughts were recruited to form a service user research group (SURG). The primary role of the SURG was to provide feedback during the development of study procedures, materials and dissemination activities. Though the involvement of people with lived experience is increasing in health research, it is not currently commonplace for researchers to explicitly report on the impact from their involvement (Domecq et al., 2014; Staniszewska et al., 2017). Nevertheless, studies that have been developed in conjunction with people with lived experience have reported higher rates of recruitment and retention of participants (Domecq et al., 2014).

2.2. Rationale for taking a mixed methods approach

A mixed methods approach was taken in order to address the overarching thesis aims, that sought to advance current understanding of the association between sleep disturbance and suicidal thoughts and behaviours, and the interrelationships with psychological factors. Definitions of '*mixed methods*' research vary (Johnson,

Onwuegbuzie, & Turner, 2007). In recognition of this, Johnson and colleagues (2007) identified key themes across definitions provided by 19 leading mixed methods researchers. Broadly, they described a '*mixed methods approach*' as the combination of quantitative and qualitative inquiry, with the goal of producing a broader or deeper understanding, and achieving corroboration (Johnson et al., 2007). It is notable that some researchers restricted the use of '*mixed methods*' to instances where quantitative and qualitative designs were integrated within a single research study (i.e. Bazeley, Chen). However, the dominant consensus across the researchers consulted was that the definition of mixed methods should be extended to include the use of quantitative and qualitative designs within a program of research (Johnson et al., 2007). Therefore, this thesis employs a mixed methods approach, consistent with the definition presented by Johnson and colleagues (2007).

It has been argued that mixed methodology is particularly appropriate for research that seeks to investigate complex human phenomena (Greene & Caracelli, 1997), making this approach well-suited to understanding suicidal thoughts and behaviours. Consistent with a mixed methods approach, a pragmatic stance was adopted, which refers to the prioritisation of finding the solution to a problem (Creswell, 2014). Therefore, it follows that methodological choices were made based on their ability to provide the most comprehensive approach to address the given research question (Creswell, 2014; Onwuegbuzie & Leech, 2005).

2.3. Rationale for population focus on depression.

Up to 90% of people with depression report symptoms of sleep disturbance (Tsuno et al., 2005). Moreover, people with depression are at an increased risk of suicidal thoughts, behaviours and death by suicide (Harris & Barraclough, 1997; Rihmer & Dome, 2016). Therefore, this thesis primarily focused on understanding the interrelationships between sleep disturbance, suicidal thoughts and behaviour, and depression. This was operationalised differently in each of the empirical studies, based on the specific study

aims. First, the qualitative interview study described in Chapter 4 was conducted with people who had current or past experience of depression. The investigation focused on understanding how sleep contributed to suicidal thoughts and behaviours, and the interrelationships with depression. Second, in the cross-sectional study, statistical adjustments were made to account for co-morbid diagnoses of depression (Chapter 5). Finally, the ecological momentary assessment study (Chapter 6) was conducted with people who were currently experiencing a major depressive episode. All analyses in this study statistically controlled for the contribution of depression.

Given the high prevalence of anxiety in those with depression and sleep problems, it was considered important to quantify participants' anxiety levels (Braam et al., 2014; T. A. Brown, Campbell, Lehman, Grisham, & Mancill, 2001). This marked a departure from previous literature that has examined the sleep/suicide relationship, and stemmed from initial discussions with the SURG, who perceived there to be substantial overlap between sleep, depression, anxiety and suicidal thoughts.

2.4. Study designs used in the thesis

This thesis contains four empirical chapters that employ various designs, generating both quantitative and qualitative data (see Table 2.1.). The methodological and analytical approaches employed in the empirical studies are detailed within Chapters 3, 4, 5, and 6. However, justification for the methodological and analytical choices, and additional information common across studies are presented in this chapter.

Table 2.1. *Overview of the empirical studies reported within this thesis.*

Chapter number	Study design	Description	Analytical approach
3	Systematic review.	Appraisal and synthesis of the empirical literature that had examined the role of psychological factors in the relationship between sleep disturbance and suicidality. Findings identified by the review were then integrated with contemporary theories of suicidal	Followed PRISMA 2009 statement and conducted quality appraisal using appropriate

		thoughts and behaviours to develop a clear research agenda.	quality assessment scale.
4	Qualitative semi-structured interview.	Investigated individuals' perceptions of the role of sleep in relation to suicidal thoughts and behaviours. Data were analysed with thematic analysis to produce a multi-pathway model.	Thematic analysis.
5	Quantitative cross-sectional, analysis of existing dataset.	Study examined two aims; 1) to explore the extent to which nightmares were related to suicidal behaviours, independent of comorbid levels of insomnia, and 2) to identify to what extent the relationship between nightmares and suicidal behaviours functions via defeat, entrapment and hopelessness.	Hierarchical regression and serial multiple-mediational analyses.
6	Quantitative ecological momentary assessment.	Investigated the bi-directional relationships between sleep and day-time levels of suicidal ideation. In addition, a moderation pathway was tested which was informed by the thematic analysis described in Chapter 4.	Multilevel random intercept models and moderation analyses.

2.4.1. Study 1: Systematic review.

Previous reviews have summarised and evaluated the evidence base regarding the relationship between sleep disturbance and suicidal thoughts and behaviours (e.g., Bernert & Nadorff, 2015; Malik et al., 2014; Pigeon, Pinquart, et al., 2012). However, no reviews have synthesised and critically evaluated the empirical literature examining the role of *psychological factors* in the sleep/suicide relationship. This is important, because not everyone who experiences sleep disturbance also experiences suicidal thoughts and behaviours. Thus, identifying the role of psychological factors and processes that contribute to this relationship is crucial to the development of a comprehensive theory, from which suitable, evidence-based interventions can be designed. Therefore, a systematic review was conducted to examine the potential role of psychological factors in the relationship between sleep disturbance and suicidal thoughts and behaviours (Chapter 3).

2.4.1.1. Rationale for a systematic review.

Systematic reviews are useful for not only synthesising and drawing conclusions based on large bodies of evidence, but also for identifying areas where convergent evidence is lacking and, hence, further research is warranted (Petticrew & Roberts, 2006). By integrating review findings with contemporary theories of suicide, a comprehensive series of mechanistic pathways were specified from which hypotheses could be generated.

Meta-analyses include the use of statistical techniques to examine the consistency of effect sizes, and produce an overall summary effect size for the studies included in the review (Borenstein, Hedges, Higgins, & Rothstein, 2009). The review presented in the thesis identified 11 empirical original studies, which assessed four different groups of psychological factors, in relation to a wide range of symptoms of sleep disturbance (i.e. nightmares, insomnia, sleep quality). A meta-analysis was deemed not appropriate due to this apparent heterogeneity across the psychological factors and symptoms of sleep disturbance. Thus, it was concluded that the production of a summary effect size or comparison of consistency of effect sizes would offer little value at this time.

A number of steps were taken to ensure that the systematic review was conducted with strong methodological rigour. First, a comprehensive search strategy was developed using a series of Medical Subject Heading terms (see Appendix A) to search four electronic databases (EMBASE, Medline, PsycINFO, Web Science). Second, hand searches were made in the previous review papers and through the publication biographies of active researchers within the field (i.e. Agargun, Bernert, McCall, Nadorff, Pigeon and Hochard). Third, the search and screening process followed the PRISMA 2009 statement (Moher, Liberati, Tetzlaff, & Altman, 2009). Fourth, to enhance reliability, 10% of the identified studies were also screened by a co-author. Fifth, review findings were critically evaluated against criteria outlined by relevant quality assessment tools (see Appendix B; Herzog et al., 2013; Walsh & Downe). Sixth, the quality appraisal was conducted by both

the author of this thesis and a co-author of the review, with any discrepancies resolved through discussion between the two authors.

2.4.2. Study 2: Qualitative interview study.

There are currently no psychological models of suicide that provide an account for the association between sleep disturbance and suicidal thoughts and behaviours. Consequently, rather than adapt a pre-existing theory, a more exploratory investigation was necessary to understand people's beliefs regarding the role of sleep in relation to suicidal thoughts and behaviours. Theory or empirical data is not a prerequisite when conducting qualitative research, which generally takes a more explorative and inductive approach to develop analytical accounts of data grounded in the context from which they are collected (Creswell, 2014). Therefore, qualitative methodology is best placed to address research questions that focus on '*understanding*' complex experiences (Hjelmeland & Knizek, 2016), such as the interplay between sleep disturbance and suicidal thoughts and behaviours.

2.4.2.1. Rationale for analytical approach.

The goal of the qualitative study was to produce an analysis that represented key patterns across the dataset, that depicted testable pathways proposed to underpin the association between sleep disturbance and suicidal thoughts and behaviours. Broadly, three approaches to qualitative analysis were considered to address this goal. First, an '*inductive*' approach refers to an analysis that is driven by the data, with no pre-existing framework (Boyatzis, 1998). Second, a '*deductive*' approach is informed by a pre-existing theory or framework, that is then utilised to guide the analysis (Boyatzis, 1998). Third, a '*hybrid*' approach adopts a combination of the two, by developing an analytical framework that is driven by an empirical or theoretical model, but also includes salient features from the dataset which are not accounted for by the deductive model (Fereday & Muir-Cochrane, 2006). Due to the absence of pre-existing theory that satisfactorily

accounts for the relationship between sleep disturbance and suicidal ideation and behaviour, an inductive approach to analysis was chosen for the qualitative study (Chapter 4). Taking an inductive approach allowed the generation of findings that remained close to the data, which is proffered as central to conducting good quality qualitative research (Henwood & Pidgeon, 1992).

After consideration of different types of inductive analytical approaches, namely, thematic analysis, interpretative phenomenological analysis (IPA) and grounded theory, an inductive thematic analysis was chosen. The use of an IPA, was discounted primarily because IPA is particularly suited to research that focuses on individual narratives, generally conducted with homogenous samples (Smith, Flowers, & Larkin, 2009). The current qualitative study sought to understand the role of specific symptoms of sleep disorders, and psychological factors, which were common across experiences of suicidal thoughts and behaviours. Hence, a heterogeneous sample was recruited, which included experience of a wide range of different symptoms of sleep problems (e.g., delayed sleep onset latency, nocturnal awakening).

Grounded theory is appropriate for research questions that seek explicitly to produce a theory to explain the studied phenomena (Holloway & Todres, 2003). Emphasis is placed on understanding the social context in which the behaviour or process takes place (Glaser & Strauss, 1967). Distinction has been made between ‘*full*’ grounded theory, and ‘*abbreviated*’ or ‘*lite*’ grounded theory (Braun & Clarke, 2006; Willig, 2013). ‘Full’ grounded theory is a time-intensive process, which involves the researcher moving through several cycles of data collection followed by analysis, before returning to collect further data (Glaser & Strauss, 1967; Willig, 2013). Furthermore, ‘full’ grounded theory traditionally draws upon a different range of data sources and data collection methods (Willig, 2013). In practise, researchers are increasingly producing a more ‘abbreviated’ or ‘lite’ form of grounded theory, which still incorporates many of the grounded theory techniques (e.g., cyclical stages of data collection and analysis), but without the extensive

triangulation of data (Braun & Clarke, 2006; Willig, 2013). In this sense, grounded theory 'lite' has many similarities to inductive thematic analysis (Braun & Clarke, 2006).

However, unlike IPA or Grounded Theory, thematic analysis was not developed from a particular philosophical viewpoint, giving the researcher the freedom to choose the appropriate epistemological approach from which to conduct their analysis (Braun & Clarke, 2006). This is compatible with the pragmatic stance taken in this mixed methods thesis, in which the specific research question drove method selection, rather than the epistemological viewpoint of the researcher (Creswell, 2014).

Finally, thematic analysis can be conducted at a semantic or latent level. Analysis that is conducted at the latent level refers to the production of a more interpretative analysis, opposed to analysis conducted at the semantic or manifest level that produces a more descriptive analysis (Braun & Clarke, 2006). The research question for the qualitative study required participants to draw on their experiences of mental health problems, sleep disturbance and suicidal experiences. In order to make sense of the complex pathways underlying these different types of experiences, a latent approach was taken.

2.4.2.2. Rationale for semi-structured interviews.

Decisions regarding the qualitative method employed for data collection should be driven by the overarching research question, analytical approach, and participant characteristics (Frith & Gleeson, 2011). The research question sought to establish patterns across the dataset which illustrated the role of sleep disturbance in relation to suicidal pathways. Both interviews and focus groups were considered as a method for collecting rich and in-depth data. Therefore, the decision to conduct semi-structured interviews opposed to focus groups was driven by considering the needs of the participant group.

The inclusion criteria for participants in the qualitative study specified experience of a major depressive episode(s) and suicidal thoughts and behaviours within the past year.

Thus, it was possible that participants recruited to this study would currently be experiencing symptoms of depression and suicidal thoughts. Although the sense of shared experience stemming from participation in focus groups can be empowering, some individuals may feel anxious at the prospect of disclosing their personal experiences with a group of people (Peters, 2010). Furthermore, participation in suicide-focused research interviews has been shown to produce positive outcomes for participants, such as improved self-awareness and understanding of their suicidal experiences (Biddle et al., 2013; Owen, Gooding, Dempsey, & Jones, 2016). Additionally, members of the SURG emphasised the need to offer flexibility in the time, location and duration of research sessions, in order to promote a more appealing and comfortable research setting for participants. These practical needs can be more easily addressed when organising one-to-one interviews in comparison to focus groups (Willig, 2013).

Semi-structured interviews were conducted to allow the researcher to ask open, yet, directed questions relevant to the specific research question. Comprehensive overviews of the different types of interviews, and guidance on how they can be conducted in medical research are provided in articles by Britten (1995) and Doody and Noonan (2013). The use of a topic guide when conducting semi-structured interviews provides structure to facilitate the collection of data which can be compared across the whole dataset, whilst allowing the researcher to retain flexibility and freedom to probe participant responses to generate further insight and narrative (Knox & Burkard, 2009). The topic guide was developed in conjunction with two members of the SURG, who participated in practice interviews to provide feedback regarding the accessibility of the questions and possible order in which to approach the different topics. For example, based on discussions with the SURG members, it was decided that the interview would start with broad questions on sleep, before building up to questions about suicidal experiences. The members of the SURG felt asking questions about sleep prior to suicidal experiences would help the researcher build rapport with participants; thus, allowing participants to

feel more comfortable discussing suicidal experiences later in the interview. A copy of the topic guide is provided in Appendix C.

2.4.3. Study 3: Cross-sectional design.

The systematic review reported in Chapter 3 identified the need for research into the possible psychological factors that may account for the association between sleep disturbance and suicidal thoughts and behaviours. Furthermore, findings from the qualitative study in Chapter 4 indicated that the role of psychological factors may differ depending on the specific symptoms of sleep disturbance. The current literature had yet to examine the psychological factors that may mediate the specific relationship between nightmares and suicidal behaviour in people with symptoms of PTSD. This was the main aim of the third study (Chapter 5). An existing dataset was utilised to test a mechanistic pathway that stemmed from a theory of suicidal behaviour, namely, the Cry of Pain (Williams, 1997; Williams et al., 2005). Co-morbid symptoms of insomnia were included as a control variable in order to assess the specific relationship between nightmares and suicidal behaviour.

2.4.3.1. Rationale for sample population.

People with mental health problems report higher levels of nightmares in comparison to healthy populations (Sheaves et al., 2015; Spoormaker et al., 2006). Nightmares appear to be particularly common amongst those who have experienced trauma, with prevalence estimates ranging between 70–90% of those with PTSD (Leskin, Woodward, Young, & Sheikh, 2002; Levin & Nielsen, 2007). In addition, people with PTSD report high levels of co-morbid depression (Ginzburg, Ein-Dor, & Solomon, 2010) and suicidal thoughts and behaviours (Panagioti, Gooding, & Tarrier, 2012b). Consequently, an existing dataset which recruited individuals with experience of trauma and symptoms of PTSD was utilised in this study.

2.4.3.2. Rationale for secondary analysis of existing dataset.

This study was a secondary analysis of existing data collected using a cross-sectional design (Panagioti, Gooding, & Tarrier, 2012a). Analysis of existing data provided a cost- and time-efficient opportunity to test a novel hypothesis (Cheng & Phillips, 2014). Secondary analysis can also maximise the value of participants' contributions (Tripathy, 2013). However, implications of this study were confined by the cross-sectional design and restricted choice of measures. Hence, results from this study were contextualised as preliminary data, which should be built on in subsequent work using longitudinal designs to assess the temporal relationships between the key studied variables.

2.4.3.3. Rationale for mediational analyses using bootstrapping procedure.

Broadly, when faced with non-normally distributed data, researchers may choose to correct this by data transformation, or alternatively they may decide to take a nonparametric approach to analyses, which do not assume normality of distribution as a prerequisite (Field, 2013). In the cross-sectional study, a nonparametric resampling technique was adopted, known as bootstrapping. Here, bootstrapped confidence intervals were produced from a simulated dataset, which is created by resampling observations from the original empirical data (Efron & Tibshirani, 1993; Shrout & Bolger, 2002). Bootstrapping is advocated for use when testing indirect effects, with small samples (Hayes, 2013; Shrout & Bolger, 2002), making this approach particularly appropriate to test the mediational pathway examined within the cross-sectional study (Chapter 5).

2.4.4. Study 4: Ecological momentary assessment (EMA).

Hypotheses reported in the systematic review (Chapter 3) and informed by the qualitative study (Chapter 4) were tested in a week-long ecological momentary assessment (EMA) study. A key gap identified in the systematic review, was the dearth of literature that has examined the temporal aspects of the interrelationships between symptoms of sleep disturbance, suicidal thoughts and behaviours, and psychological factors. There is

also limited research that has investigated objective and subjective measures of sleep disturbance in parallel, to identify the specific symptoms that are associated with suicidal ideation. Consequently, the final empirical study in this thesis sought to address these limitations (Chapter 6).

2.4.4.1. Rationale for the EMA study design.

EMA, or the experience sampling method (ESM), is a micro-longitudinal method and refers to the repeated collection of data points, at multiple times each day, across a series of days (Larson & Csikszentmihalyi, 1983). This design offered three clear advantages in comparison with alternative quantitative methods. First, unlike the retrospective questionnaires traditionally used in psychological suicide research, EMA assesses the in-the-moment thoughts and feelings of participants, and hence, is less likely to be affected by retrospective bias (Davidson, Anestis, & Gutierrez, 2017). Second, suicidal ideation has been shown to fluctuate across a day (Ben-Zeev, Young, & Depp, 2012; Kleiman et al., 2017), and similarly, sleep disturbance varies on a night-to-night basis (Lemola, Ledermann, & Friedman, 2013; Vallieres, Ivers, Bastien, Beaulieu-Bonneau, & Morin, 2005). Therefore, it was more appropriate to measure the association between symptoms of insomnia and suicidal ideation across a period of consecutive days and nights. Third, by providing participants with an electronic watch, EMA ratings of suicidal ideation and mood can be captured in real-world settings, generating findings which have a higher level of ecological validity (Larson & Csikszentmihalyi, 1983).

The study protocol was developed based on the published guidance for conducting mental health-focused EMA research (Palmier-Claus et al., 2011). A key departure from the guidance provided by Palmier-Claus and colleagues (2011) related to the sampling window, which is typically set as 7:30 or 8:00 until 22:00 or 22:30 (Ben-Zeev et al., 2012; Larson & Csikszentmihalyi, 1983). Here, participants scheduling windows were customised based on their own habitual sleep-wake times, to reduce the likelihood of the

sampling disrupting their sleep (Husky et al., 2014; Mulligan, Haddock, Emsley, Neil, & Kyle, 2016; Mulligan, Haddock, Littlewood, & Kyle, in press).

In addition, the EMA procedure was finalised through an extensive piloting process with support of the SURG. Specifically, the item pool, scale and sampling schedule was piloted and revised in two stages. First, two members of the SURG piloted the study alongside members of the research team, based on a schedule of 10 repeated assessments per day. SURG members provided feedback regarding the process of completing the EMA study, the wording and scale used for each item and the acceptability of the number of days and daily samples. Second, the study procedure and items were revised based on this feedback and then piloted a final time with two additional members of the SURG. The finalised list of EMA items included in the study is provided in Appendix D.

Data analysed in this EMA study (Chapter 6) have a two level structure (day-level and participant-level). Day-level data comprised of night-time assessments of sleep and the day-time mean of six assessments of suicidal ideation. The day-level data is clustered within the participant-level data. Consequently, power calculations based on the number of participants alone will not account for the multilevel structure of the data (Snijders, 2005). Both estimates of the within and between subject variation for the outcome and covariate variables are necessary to conduct a suitable power calculation (Carter, 2016). However, given that these estimates were not readily available, a power calculation was deemed not appropriate. Therefore, the target sample size and sampling schedule were driven through consideration of the need to balance participant burden, the predicted level of missing data, and comparisons to similar mental health EMA studies (e.g., Husky et al., 2014; Mulligan et al., 2016). Suicidal thoughts were assessed multiple times each day, across a series of days in order to sample a range of time periods throughout the study. Minimal research has used an EMA design to assess the mechanisms underlying suicidal thoughts and behaviours (Davidson et al., 2017). However, previous research has

indicated that five daily assessments of self-harm or suicidal thoughts across a 7-day study appeared to be both feasible and acceptable to participants (Husky et al., 2014). In the current EMA study, the decision regarding the acceptable number of days, and daily samples, was defined through piloting the procedure with members of the SURG. Consequently, the EMA study included up to a maximum of six daily assessments of suicidal ideation, conducted across seven consecutive days (Chapter 6). The use of electronic assessment diaries has been shown to yield high compliance rates in studies involving people with mental health problems (Palmier-Claus et al., 2011). Indeed, a recent study employed the PRO-Diary watch to assess sleep in relation to experiences of psychosis in a sample of 22 participants, which reported compliance rates between 77.4% - 97.4% (Mulligan et al., 2016). Therefore, having considered the aforementioned criteria, the target sample size was set at 50 participants, assessed across a seven day sampling period, which could yield up to 350 observations per day-level variable.

2.4.4.2. Rationale for multilevel modelling.

Multilevel models were used to analyse the data because this statistical technique can accommodate non-independent data that is structured across multiple levels (Snijders & Bosker, 1999). A two-level random intercept model (participant-level, and day/night-level) was used to examine the night-to-day, day-to-night associations between sleep disturbance and suicidal ideation. The random intercept model was chosen, opposed to a random slope model, as it accounts for the likelihood that participants will have different levels of the outcome variable (i.e. suicidal ideation or sleep disturbance), yet it assumes the relationship between the two is consistent across the population.

2.5. Overview of constructs examined

A description of the assessment tools and questionnaire measures used are provided within the methodology sections of each of the empirical chapters. Consequently, the following section will focus on the rationale behind the choice of

measures used in the qualitative interview (Chapter 4) and quantitative EMA studies (Chapter 6). Choice of measures in the cross-sectional study reported in Chapter 5 were made by the researcher who collected the data, Dr Maria Panagioti. Hence, the rationale for these measures is not provided within the following section. Quantitative measures were utilised to: i. screen potential participants against the eligibility criteria in the interview and EMA studies (Chapters 4 and 6), ii. characterise the sample in the interview and EMA studies (Chapters 4 and 6), and iii. assess specified variables in the EMA study. A full overview of constructs measured and examined in this thesis are provided in Table 2.2.

Table 2.2. *Overview of constructs measured within the thesis.*

Construct	Variable	Examined by
Sleep disturbance	Insomnia symptoms	Sleep Condition Indicator (Espie et al., 2014) ^{a, c} , participant narrative ^a , Clinician-Administered PTSD Scale for DSM-IV items (Blake et al., 1995) ^b , Consensus sleep diary (Carney et al., 2012) ^c , actigraphy ^c .
	Nightmares	Participant narrative ^a , Clinician-Administered PTSD Scale for DSM-IV items (Blake et al., 1995) ^b .
	Sleep quality	Pittsburgh Sleep Quality Index (Buysse et al., 1989) ^{a, c} , participant narrative ^a , Consensus sleep diary (Carney et al., 2012) ^c .
Suicide	Suicidal thoughts	Beck Scale for Suicidal Ideation (Beck, Steer, & Ranieri, 1988) ^{a, c} , participant narrative ^a , EMA item ^c .
	Suicidal behaviours	Beck Scale for Suicidal Ideation (Beck et al., 1988) ^{a, c} , participant narrative ^a , Suicide Behaviors Questionnaire-Revised (Osman et al., 2001) ^b .
Psychological factors	Defeat	Participant narrative ^a Defeat scale (Gilbert & Allan, 1998) ^b .
	Entrapment	Participant narrative ^a , Entrapment scale (Gilbert & Allan, 1998) ^b , EMA item ^c .
	Hopelessness	Participant narrative ^a , Beck Hopelessness Scale (Beck et al., 1974) ^b .
Mental health problems	Depression	Structured Clinical Interview for DSM disorders (First, Spitzer, Gibbon, & Williams, 1997) ^{a, c} Participant narrative ^{a, b} , Patient Health Questionnaire-9 (Kroenke, Spitzer, & Williams, 2001) ^{a, c} , Beck Depression Inventory II (Beck, Steer, & Brown, 1996) ^{a, c} .
	Anxiety	Participant narrative ^a , State Trait Anxiety Inventory (Spielberger, 1983) ^{a, c} .

Note: Measure included in ^aChapter 4 qualitative study, ^bChapter 5 cross-sectional study, ^cChapter 6 ecological momentary assessment study.

2.5.1. Sleep disturbance.

A common criticism of the previous work in this area is centred on the limited operationalisation of sleep disturbance (Bernert & Nadorff, 2015). Subjective measurement of sleep has dominated the field of sleep and suicide research, yet the measurement tools used are diverse. They range from non-validated, or single-items to assess sleep disturbance (e.g., Agargun, Kara, & Solmaz, 1997b; Gelaye et al., 2017; Qian et al., 2017; Winsler et al., 2015), to the administration of validated, sleep disorder-specific scales, such as the Insomnia Severity Scale (e.g., Bernert et al., 2005; Cukrowicz et al., 2006; McCall et al., 2010; Nadorff et al., 2011; Zuromski et al., 2017). Inconsistent measurement of sleep disturbance is an issue that has plagued the wider field of sleep and insomnia research. This has led to the development of a series of recommendations regarding sleep measurement in insomnia research (Buysse, Ancoli-Israel, Edinger, Lichstein, & Morin, 2006). This guidance recommended the use of the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) to assess subjective sleep quality and disturbance. This scale has been shown to have high internal consistency, $\alpha = .83$ (Buysse et al., 1989). Consequently, the PSQI was used both to screen potential participants, and to characterise the samples in relation to their sleep quality. The Cronbach's alpha for the PSQI was .74 in the qualitative study (Chapter 4) and .64 in the EMA study (Chapter 6). A copy of the PSQI is provided in Appendix E.

In order to provide a more through characterisation of the role of sleep in relation to suicidal thoughts and behaviours, two diagnosis-driven measures of sleep disorders were administered. First, the Sleep Condition Indicator (SCI; Espie et al., 2014) was selected to assess participant symptoms against the diagnostic criteria for DSM-V Insomnia Disorder (used in Chapters 4 and 6). This questionnaire was chosen because it has shown high sensitivity for detecting a probable insomnia disorder, and previous evaluation of the scale's internal consistency yielded a high alpha coefficient, $\alpha = .86$

(Espie et al., 2014). The Cronbach's alpha of the SCI in the qualitative study was $\alpha = .89$, and $\alpha = .77$ in the EMA study. See Appendix F for a copy of the SCI.

The second diagnosis-driven measure was produced by members of the British Association for Psychopharmacology, to guide practitioners in identifying the possible presence of the following sleep disorders: i. narcolepsy, ii. sleep breathing disorder, iii. periodic limb movement syndrome, or restless leg syndrome, iv. circadian rhythm sleep disorder, and v. parasomnia (Wilson et al., 2010). This measure comprises five initial screening items that correspond with the aforementioned disorders. This measure was used to aid the exploration of symptoms of organic sleep disorders experienced by participants in the qualitative interview study (Chapter 4). A copy of this brief screening tool is provided in Appendix G.

Sleep patterns can be effectively measured through the use of a wrist actigraphy watch which provides an objective estimate of sleep by continuously monitoring the wearer's movements (Ancoli-Israel et al., 2015). Although polysomnography is considered the gold standard measure of objective sleep (Buysse et al., 2006), actigraphy provides a suitable alternative to polysomnography and is particularly appropriate for studies that seek to monitor sleep-wake patterns unobtrusively over a period of nights, in the natural environment of the participant (Ancoli-Israel et al., 2015). Therefore, an actigraphy watch (see Figure 2.1.) was deemed more suitable to provide assessment of objective sleep parameters in the EMA study (Chapter 6). Three sleep variables were calculated from this data to assess symptoms of insomnia; difficulty initiating sleep assessed by sleep onset latency (time from intention to sleep to sleep onset), difficulty maintaining sleep assessed by sleep efficiency (percentage of time spent in bed asleep), and sleep duration assessed by total sleep time (total time spent asleep according to epoch-by-epoch wake/sleep categorisation).



Figure 2.1. PRO-Diary actigraphy watch (CamNtech, Cambridge, UK) used in EMA study (Chapter 6).

Sleep diaries are recommended for the daily subjective assessment of sleep (Buysse et al, 2006). Consequently, the expanded consensus sleep diary (Appendix H; Carney et al., 2012) was chosen for use in the EMA study (Chapter 6). This is considered the ‘*gold standard*’ sleep diary (Mulligan et al., 2016) and was developed through consultation of 25 sleep experts. In order to assess symptoms of insomnia, four sleep variables were calculated from the diary data, namely, total sleep time, sleep efficiency, sleep onset latency and sleep quality, which was based on a 5-point Likert scale ranging from ‘*very poor*’ to ‘*very good*’.

2.5.2. Suicidal ideation and behaviour.

Prevalence rates show that there are a substantial number of people who will think about suicide at some stage in their lives, but will never make a suicide attempt (McManus et al., 2016; Nock et al., 2008). Therefore, when investigating factors which contribute to suicide, it is important to assess relationships to suicidal ideation and suicidal behaviour. Suicidal ideation and behaviours are typically measured by self-report questionnaires or by an interviewer or clinician administered rating scale (G. K. Brown, 2001). Researchers

have reported high levels of agreement between ratings of historical suicidal ideation and behaviours when using interviewer administered scales in comparison to self-report scales (Kaplan et al., 1994). However, discrepancies have been reported when comparing ratings of current suicidal ideation and behaviour, with participants more likely to disclose current suicidal ideation and behaviour when completing self-report questionnaires (Kaplan et al., 1994; Yigletu, Tucker, Harris, & Hatlevig, 2004). Given that the empirical work in this thesis sought to quantify current suicidal ideation, a self-report questionnaire of suicidal ideation was chosen.

An extensive review of 19 self-report measures of suicidal thoughts and behaviours identified that the Beck Scale for Suicidal Ideation (BSSI; Beck et al., 1988) and the Adult Suicidal Ideation Questionnaire (ASIQ; Reynolds, 1991) possess the most comprehensive psychometric validation (Batterham et al., 2015). The BSSI was chosen over the ASIQ because the BSSI includes items which relate to both passive and active suicidal ideation, and hence, provides a broader assessment of suicidal ideation. Moreover, the BSSI also includes two additional, non-scored items which capture history of lifetime suicide attempts. Therefore, this scale was used to characterise the sample in Chapters 4 and 6, to indicate current levels of suicidal ideation (sum of items 1-19) and previous suicidal behaviour (items 20 and 21). Cronbach's alpha was high in both the interview study $\alpha = .87$ and in the EMA study $\alpha = .81$. See Appendix I¹ for a copy of the BSSI.

The item '*Right now I am feeling suicidal*' was used to assess in-the-moment suicidal ideation in the EMA study (Chapter 6), with assessments made on a 7-point Likert scale ranging from 1 = not at all, to 7 = very much so. The author was not aware of any published research which has validated items to assess suicidal ideation within an EMA study. Therefore, a systematic approach was taken to developing the EMA items. First, a large pool of items from EMA diaries used previously by members of the supervisory

¹ Due to the assessment measure copyright, this measure has been removed from the Appendices.

team was generated (e.g., Mulligan et al., 2016). Second, additional items were developed from the transcripts collected in the qualitative study (Chapter 4; Littlewood, Gooding, Kyle, Pratt, & Peters, 2016). Third, the large pool of items was piloted with members of the SURG, who provided feedback on each of the items. Items were revised accordingly to produce the finalised set of items used in the study. Despite this comprehensive approach to developing the EMA items, it should be noted that the single-item assessment of suicidal ideation failed to measure the different aspects of suicidal ideation, such as passive ideation, e.g., I do not want to live. Subsequent research could consider using a multi-item approach, which would provide a more comprehensive measure of suicidal ideation.

2.5.3. Comorbid symptoms of depression and anxiety.

Sleep disturbance is a common feature of mental health problems, and is included within diagnostic criteria for depression, PTSD, and anxiety disorders (APA, 2013). Furthermore, those who experience mental health problems have an elevated risk of suicidal thoughts and behaviours (Nock et al., 2008). Consequently, it is important that research examining the relationship between sleep disturbance and suicidal thoughts and behaviours seeks to account for interrelationships with mental health problems. As outlined in section 1.3, the empirical work included in this thesis focused specifically on interrelationships with depression. Hence, one of the primary inclusion criteria for the qualitative and EMA studies was previous experience of a major depressive episode(s). This was assessed in two parts. First, telephone administration of the 9-item Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001), was utilised to ensure that the initial telephone screening was efficient, and maximise the likelihood that individuals who were invited for the face-to-face screening assessment would meet the eligibility criteria. The PHQ-9 was chosen because it is one of few depression symptomology measures which has been validated for telephone-administration (Fine et al., 2013). The clinical cut off score of 10 and above has demonstrated good sensitivity (0.77) and specificity (0.85) for

detecting major depressive disorder (Manea, Gilbody, & McMillan, 2015). A copy of the PHQ-9 is provided in Appendix J.

Second, those who were identified as eligible via the telephone screen were invited to a face-to-face meeting. The Structured Clinical Interview for DSM disorders (SCID; First et al., 1997) was then utilised to confirm experience of a major depressive episode based on the DSM-V diagnostic criteria. The SCID is proffered to be the '*gold standard*' of assessments of mental health problems (Lobbestael, Leurgans, & Arntz, 2011). It should be noted that the SCID for DSM-IV Module A (Mood Episodes) was administered, as the SCID for DSM-V was yet to be published on commencement of this programme of work. However, assessment was made to reflect the DSM-V criteria (APA, 2013), which included one revision from the DSM-IV criteria (APA, 2000), i.e. the omission of the exclusion criteria related to recent bereavement.

In addition, questionnaire measures of depressive symptom severity and anxiety were administered to participants in the qualitative and EMA studies (Chapters 4 and 6). This was used within the qualitative study to provide descriptive statistics as part of the characterisation of the sample. In the EMA study (Chapter 6), the measures of depressive symptoms and anxiety were included as control variables within the statistical analyses. Choice of suitable questionnaire measures for severity of depressive symptoms and anxiety adhered to the recommendations made in the guidance for insomnia-focused research (Buysse et al, 2006). Thus, the Beck Depression Inventory II (BDI-II; Beck et al., 1996) and the State Trait Anxiety Inventory (STAI-T; Spielberger, 1983, 2010) were utilised within the studies described in Chapters 4 and 6. Both measures showed high internal consistency, the BDI-II yielded $\alpha = .95$ in the qualitative study (Chapter 4), and $\alpha = .88$ in the EMA study (Chapter 6), and the STAI-T produced $\alpha = .94$ in the qualitative study (Chapter 4), and $\alpha = .89$ in the EMA study (Chapter 6). Copies of the BDI-II and STAI-T are provided in Appendices K¹ and L¹.

2.5.4. Psychological factors

Quantitative measures of psychological factors were included in the cross-sectional (Chapter 5) and EMA studies (Chapter 6). The choice of questionnaire measures for defeat, entrapment and hopelessness used in the cross-sectional study were made by the researcher who collected the original dataset (Dr Maria Panagioti). Entrapment was assessed in the EMA study using two items which sought to measure the different aspects of this construct, '*Right now I want to escape my emotional pain,*' and '*Right now I feel trapped*'. Responses to each item were made using a 7-point Likert scale ranging from 1 = not at all, to 7 = very much so. These items were developed as part of the same process described for the suicidal ideation item in section 2.5.2.

2.6. Safety of participants

Participation in suicide-focused research may produce distress for some individuals. This important ethical concern has been investigated across studies employing a range of research designs (e.g., Biddle et al., 2013; Gibson, Boden, Benson, & Brand, 2014; Husky et al., 2014; Owen et al., 2016; Taylor et al., 2010). A systematic review indicated that research participation which included questions about suicidal thoughts and behaviours was not associated with an increase in suicidal thoughts or acts (Dazzi, Gribble, Wessely, & Fear, 2014). That said, when conducting ethical research it is important to seek to minimise potential harm for research participants (World Medical Association, 2013). Therefore, a safety protocol was developed with support of a Clinical Psychologist (co-supervisor Dr Daniel Pratt), for use in Chapters 4 and 6 (Appendix M). The protocol included steps which sought to minimise the risk of participants becoming distressed, and direct the author's response in relation to risk information during the research process. Development of the protocol was informed by the best practice for conducting suicide-focused research as outlined by Owen et al. (2016). Members of the SURG also guided the adaptation of the safety procedure for the EMA study. Specifically, they suggested the addition of a second check-in call on the fourth day of the study

sampling period, in order to assess participant wellbeing and address any questions or concerns.

Briefly, this protocol included steps to reduce the likelihood that participants would experience distress, such as the opportunity to take breaks during the qualitative study, follow-up phone calls to check participant wellbeing and mood following participation, and a post-research evaluation interview to enable participants to feedback their thoughts regarding the research experience. However, the protocol also included a process for responding to risk, should a participant disclose information to indicate that they were at risk of harming themselves or another person. Response to risk and the limits of confidentiality in relation to risk information were discussed with participants prior to taking informed consent. Further details regarding the safety protocol can be found in Appendix M.

CHAPTER 3.

3. Examining the role of psychological factors in the relationship between sleep problems and suicide

This paper has been published in Clinical Psychology Review

Littlewood, D. L., Kyle, S. D., Pratt, D., Peters, S., & Gooding, P. (2017). Examining the role of psychological factors in the relationship between sleep problems and suicide. *Clinical psychology review*, 54, 1-16.

3.1. Abstract

We sought to conduct the first systematic review of empirical evidence investigating the role of psychological factors in the relationship between sleep problems and suicidal thoughts and behaviours. Twelve studies were identified which examined psychological factors grouped into four categories of cognitive appraisals, psychosocial factors, emotion regulation strategies, and risk behaviours. Although there was substantial heterogeneity across studies with respect to measurement, sampling, and analysis, preliminary evidence indicated that negative cognitive appraisals, perceived social isolation, and unhelpful emotion regulation strategies may contribute to the association between sleep problems and suicidal thoughts and behaviours. Given that findings in this area are currently restricted to studies with cross-sectional designs, the directionality of the interrelationships between these psychological factors, sleep problems and suicidality, remains unclear. We integrate the findings of our review with contemporary psychological models of suicidal behaviour to develop a clear research agenda. Identified pathways should now be tested with longitudinal and experimental designs. In addition, a more thorough investigation of the complexities of sleep, psychological factors, and suicidal thoughts and behaviours is crucial for the development of targeted psychological interventions.

3.2. Introduction

*“The best bridge between despair and hope is a good night's sleep” E. Joseph
Cossman*

Each year approximately 800,000 lives worldwide are lost to suicide, equating to one death every 40 seconds (World Health Organisation, 2014). In the US, the most recent estimates of suicide deaths indicate that there were 13.4 suicides per 100,000 people in 2014 (Centers for Disease Control and Prevention, 2015), and in the UK this estimate was 10.8 suicides per 100,000 (National Office for Statistics, 2016). Interventions to prevent suicide are important, not only to the individual at risk of suicide, but also to the many

people who are likely to be affected in the event of an individual's death. For example, those bereaved by suicide experience elevated levels of depression (Séguin, Lesage, & Kiely, 1995), substance use (Brent, Melhem, Donohoe, & Walker, 2009), and suicidal behaviours (Pitman, Osborn, King, & Erlangsen, 2014).

Suicidal thoughts and behaviours have been conceptualised to lie on a continuum whereby those who experience suicidal thoughts may progress to make suicide plans and then, subsequently, make an attempt or die by suicide (Johnson, Gooding, & Tarrier, 2008; Tarrier, et al., 2013; ten Have, et al., 2009). Indeed, prevalence data from a study of 17 countries estimated that 33.6% of individuals who experience suicidal thoughts and feelings will subsequently develop a suicide plan, and 56% of those with a plan will make a suicide attempt (Nock, et al., 2008). Therefore, identifying and intervening at the start of this trajectory is imperative to developing effective suicide prevention strategies.

3.2.1. Sleep problems as a modifiable risk factor for suicidality.

Research into suicide has identified a number of clinical and sociodemographic risk factors which may trigger and maintain suicidal thoughts and behaviours, such as, mental health problems, sleep problems, unemployment, gender, and age (Bernal, et al., 2007; Borges, et al., 2010; Nock, et al., 2008; Pigeon, Piquart, & Conner, 2012; Qin, Mortensen, Agerbo, Westergaard-Nielsen, & Eriksson, 2000). Although many of the identified risk factors are impossible or difficult to change (e.g., gender, unemployment), sleep patterns can be effectively modified using existing psychological interventions (Wu, Appleman, Salazar, & Ong, 2015). Furthermore, recent findings indicate that cognitive-behavioural therapy for insomnia not only benefits sleep, but may also reduce levels of suicidal ideation (Trockel, Karlin, Taylor, Brown, & Manber, 2015). Moreover, reducing risk of suicide via treatment of sleep problems may be more acceptable to those individuals who are reluctant to seek treatment for mental health problems due to perceptions of stigma, for example (Bernert, Iwata, Kim, Moscovitz, & Horn, 2015).

Sleep problems are commonly experienced by individuals with mental health problems, such as depression and post-traumatic stress disorder. Consequently, it is important to understand the interrelationships between specific mental health problems, sleep problems and suicidal behaviour. For instance, one possible explanation of the sleep/suicide relationship is that sleep operates indirectly to increase suicide risk, because sleep problems increase the likelihood of depression (Baglioni, et al., 2011) and depression, in turn, increases the risk of suicidal thoughts and behaviours (Harris & Barraclough, 1997). Findings from studies examining the interrelations between depression, sleep problems and suicidality are mixed, with divergent patterns of results emerging from studies examining insomnia (Bryan, et al., 2015; Nadorff, Anestis, Nazem, Harris, & Winer, 2014; Nadorff, Fiske, Sperry, Petts, & Gregg, 2013; Ribeiro, et al., 2012). However, research examining nightmares has consistently shown an association between nightmares and suicidal thoughts and behaviours, independent of the effects of depression (Pigeon, et al., 2012). This indicates that the role of depression in the sleep/suicide relationship varies dependent on the specific type of sleep problem experienced. Therefore, it is important to determine which other factors may influence the relationship between suicidal ideations and acts, and different types of sleep problems. Furthermore, given the high prevalence of sleep problems in clinical and non-clinical populations (Roth, et al., 2006), it would be prudent to establish the possible transdiagnostic, psychological mechanisms which account for the sleep/suicide relationship.

3.2.2. Role of psychological processes in the association between sleep problems and suicidality.

It is plausible that psychological factors may play a role in the mechanisms underlying the relationships between sleep problems and suicidal thoughts and behaviours. This is because the presence of sociodemographic risk factors alone do not account for the complexity and variance within suicidal pathways (Gooding, et al., 2015; Johnson, et al.,

2008; O'Connor & Nock, 2014; Panagioti, Gooding, & Tarrier, 2015; Tarrier, et al., 2013). Understanding psychological mechanisms that underpin suicidal pathways is crucial to the development of clinical interventions to prevent subsequent suicide attempts and deaths (Johnson, et al., 2008; O'Connor & Nock, 2014; Tarrier, et al., 2013). Previous reviews have proposed possible psychological processes and mechanisms which may influence the sleep/suicide relationship (McCall & Black, 2013; Winsper & Tang, 2014; Woznica, Carney, Kuo, & Moss, 2015). However, no previous review has systematically evaluated and critically appraised the empirical evidence base relating to the role of specific psychological processes and mechanisms in the sleep/suicide relationship. This was the main aim of the current review.

Psychological theories of suicide provide a framework for understanding the way in which a combination of the vulnerabilities produced from sociodemographic risk factors may interact with cognitive and psychological processes to account for the development of suicidal thoughts and behaviours (Johnson, et al., 2008; O'Connor & Nock, 2014; Tarrier, et al., 2013). For example, psychological factors, such as hopelessness, have been shown to further elevate risk of suicide in individuals who also reported sociodemographic risk factors, such as living alone and unemployment (Steeg, et al., 2016). Practically, these theoretical frameworks are important in the development of clinical interventions. The Medical Research Council guidelines on developing interventions highlight the importance of a coherent theoretical basis for the development of optimally effective interventions (Craig, et al., 2008). In recognition of this, the second aim of the current review was to integrate psychological theories of suicide with the review findings to outline the role of psychological factors in the relationship between sleep problems and suicidal thoughts and behaviours, from which hypotheses for future work can be generated and tested.

3.3. Method

3.3.1. Search strategy.

In order to be comprehensive and maximally inclusive, studies were sought which aimed to examine the relationship between sleep quality and/or sleep disorders, suicidal thoughts and behaviours, and a psychological process or factor. To aid comprehension, the term ‘suicidality’ will be used for instances where both suicidal thoughts and behaviours were examined.

Four electronic databases (EMBASE, Medline, PsycINFO, Web of Science) were searched up to July 2016, using a combination of Medical Subject Heading (MeSH) terms and text words for suicide and sleep. Given that there are differences in the indexing of MeSH terms used by the different databases, a full list of all identified terms is detailed in Appendix A. Filters were used to limit search results to those published in journals in English.

Hand searches were conducted in two stages. First, the reference sections within all papers identified for inclusion within the review were scrutinised for omissions. Second, the reference sections of existing review and position papers on the relationship between sleep and suicide were also checked for omissions (Agargun & Besiroglu, 2005; Bernert & Joiner, 2007; Bernert, Kim, Iwata, & Perlis, 2015; Bernert & Nadorff, 2015; Liu & Buysse, 2006; Malik, et al., 2014; McCall & Black, 2013; Norra, Richter, & Juckel, 2011; Pigeon & Caine, 2010; Pigeon, et al., 2012; Singareddy & Balon, 2001; Winsper & Tang, 2014; Woznica, et al., 2015). Furthermore, the publication history of prominent researchers actively investigating the sleep suicide relationship, were reviewed for additional papers which could be included (i.e., Agargun, Bernert, McCall, Nadorff, Pigeon and Hochard).

3.3.2. Eligibility criteria.

Studies were included in the review based on the following four eligibility criteria:

1. An empirical study (quantitative or qualitative) published in a peer reviewed journal in the English language.
2. Reported original empirical findings (i.e., reviews, practice recommendations, comments, replies, letters, opinion/position papers, practice guidelines, conference abstracts or theses were excluded).
3. Aimed to examine the role of psychological factor(s) in explaining the relationship between sleep problems and suicidal thoughts or behaviours. In quantitative work this is most clearly exemplified by pathway, mediation or moderation analyses. In qualitative studies this approach is most clearly illustrated by topic guides and analyses that make specific reference to the relationship between sleep and suicide.
4. Included a measure of any type of suicidal thoughts, plans, risk, behaviours, and deaths (papers examining self-injury without suicide intent were not included); an objective or subjective assessment of any type of sleep problem (e.g., trouble getting to sleep at night, nightmares, hypersomnia, insomnia); and a measure of a psychological factor. For the purposes of the review, variables were deemed to be a psychological factor if they represented cognitions (e.g., memory, attention, executive function, information-processing), emotions (e.g., happiness, sadness, fear), metacognitions (e.g., appraisals of sociocognitive emotional factors, hopelessness, defeat, entrapment), psychosocial factors (e.g., loneliness, social isolation) or risk behaviours (e.g., aggression, impulsivity). Papers which measured the presence of mental health problem (e.g., psychosis, major depressive disorder) together with sleep problems and suicidality, but with no measurement of psychological factors were excluded.

In order to optimise inclusion for this review, we used no restrictions pertaining to the age of the sample (e.g., adolescents, working age adults, elderly individuals).

3.3.3. Management of search outcomes and study eligibility screening.

This systematic review was conducted with guidance from the PRISMA 2009 statement (Moher, Liberati, Tetzlaff, & Altman, 2009). Figure 3.1 provides an overview of the search and screening processes. The first author (DL) screened the search results against the identified eligibility criteria. In addition, the last author (PG) screened 10% of the identified studies, to provide a measure of the reliability of the screening process, with any disagreements resolved through discussion between the two authors.

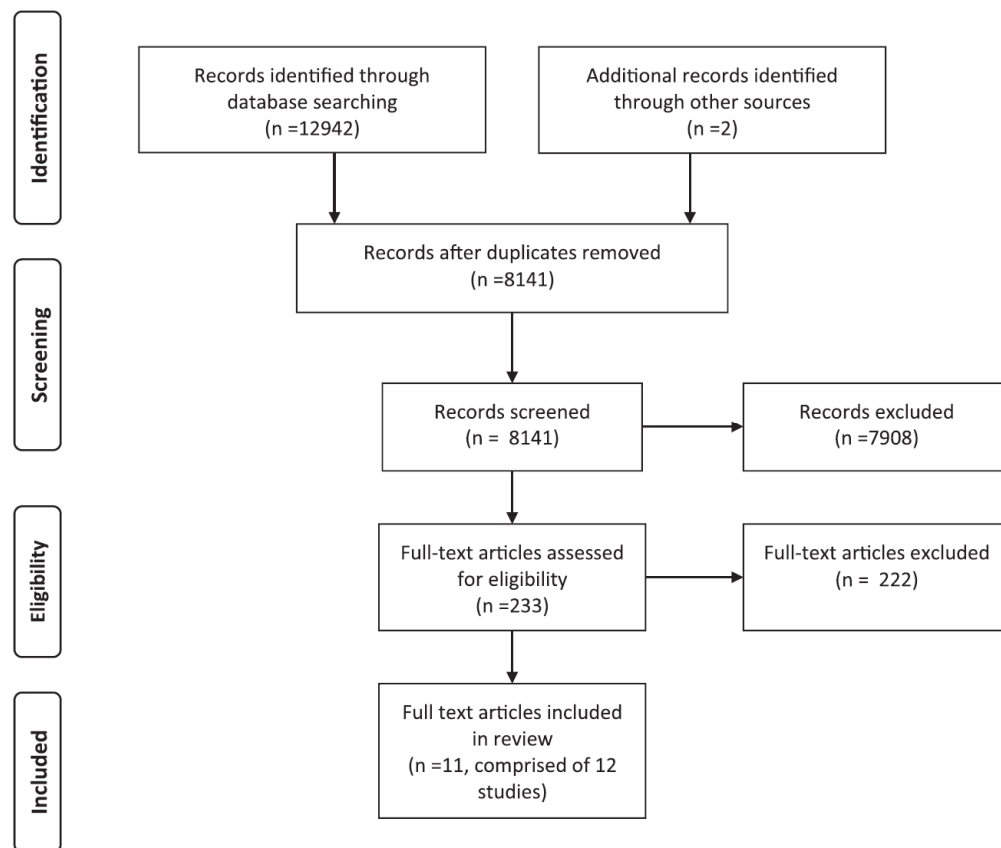


Figure. 3.1. PRISMA flow diagram illustrating the processes of literature searches and screening.

3.3.4. Quality appraisal.

Critical appraisal of the methodological quality of the identified studies was conducted independently by the first (DL) and last (PG) authors. Discrepancies in ratings were resolved through discussion between the two authors. It was considered appropriate to evaluate quality specifically based on criteria pertinent to the research designs

employed within the identified studies. Consequently, six criteria were adapted from the modified Newcastle-Ottawa Quality Assessment Scale for cross-sectional studies (Herzog, et al., 2013) and the Walsh and Downe (2006) scale for appraising qualitative studies. Relevant criterion from both scales were selected to permit assessment against the same key criteria pertaining to quality of the reported research methodology and analysis for both the qualitative and quantitative studies identified within this search (see Appendix B). Total quality ratings for each study are included in Table 3.1, with 0 – 3 indicating low quality, 4 - 6 moderate quality, and 7 - 9 high quality. Formally evaluating the quality of the identified studies provided an additional indication of the strength of the evidence, alongside the extent to which findings converged.

3.4. Results

3.4.1. Study characteristics.

The literature search yielded twelve original research studies that investigated the role of psychological variables in relation to the association between sleep problems and suicidality (see Table 3.1). These were reported in 11 papers. Five studies were based on student or adolescent samples (Bozzay, Karver, & Verona, 2016; Chu, et al., 2016; Nadorff, et al., 2014²; Zschoche & Schlarb, 2015), four studies included healthy community-dwelling participants (Golding, Nadorff, Winer, & Ward, 2015; Hochard, Heym, & Townsend, 2016; Weis, Rothenberg, Moshe, Brent, & Hamdan, 2015; Woosley, Lichstein, Taylor, Riedel, & Bush, 2014) and the remaining three studies were conducted with clinical populations (Littlewood, Gooding, Kyle, Pratt, & Peters, 2016; Littlewood, Gooding, Panagioti, & Kyle, 2016; McCall, et al., 2013). All studies adopted a quantitative cross-sectional design ($n = 11$), with the exception of a single qualitative study in which an inductive thematic analysis was performed (Littlewood, Gooding, Kyle, et al., 2016).

² Nadorff, et al., 2014 presents results from two independent studies.

Table 3.1. *Summary of studies which have examined the relationship between sleep, suicidality and psychological factors.*

Study	Sample	Design	Sleep variable	Suicide variable	Psychological variable	Analysis	Main Finding	Quality score
Bozzay, et al. (2016)	483 healthy undergraduate students <i>Mage</i> = 20.4 (3.87), 100% female	Cross-sectional	Insomnia (ISI)	Suicidal thoughts (ASIQ)	Hopelessness (BHS); Fatigue (MFI); appraised social-problem solving (SPSI-R-SF)	Path analysis	Hopelessness, social problem-solving and fatigue partially explained the relationship between insomnia and suicidal thoughts, independent of depressive symptoms. Higher depressive symptoms moderated the relationships between social problem-solving and hopelessness, to amplify suicidal thoughts.	7
Chu, et al. (2016)	552 healthy undergraduate students <i>Mage</i> = 21.53 (2.25), 74.5% female	Cross-sectional	Insomnia (ISI)	Suicidal thoughts (DSI-SS)	Thwarted belongingness (INQ)	Multiple linear regression and mediation analysis	Thwarted belongingness significantly mediated the relationship between insomnia severity and suicidal thoughts.	7
Golding, et al. (2015)	167 older adults aged 55+. <i>Mage</i> = 60.64 (4.94), 74.3% female	Cross-sectional	Insomnia (ISI); Insomnia duration (If	Suicidality (SBQ)	Acquired capability (ACSS-FAD); Perceived	Multiple linear regression	Duration of nightmares was associated with suicidality, independent of acquired capability	7

			you have an insomnia problem, how long have you had it for?); Nightmares (DDNSI); Nightmares duration (single item from DDNSI)		burdensomeness and thwarted belongingness (INQ)		for suicide, perceived burdensomeness, thwarted belongingness, current insomnia symptoms, and current nightmares. However, duration of insomnia symptoms was not significantly associated with suicidality independent of acquired capability for suicide, perceived burdensomeness, thwarted belongingness, current insomnia symptoms, current nightmares and duration of nightmares.	
Hochard, et al. (2016)	540 adults Mage = 24.2 (7.9), 74.3% female	Cross-sectional	Insomnia (ISI); Nightmares (DDNSI)	Suicidal thoughts (DSI-SS)	Acquired capability (mod-DSHI) Entrapment (Entrapment scale)	Multiple linear regression	Acquired capability interacted with both insomnia and nightmares to significantly predict suicidal thoughts. Entrapment interacted with both insomnia and nightmares to significantly predict suicidal thoughts.	7

Littlewood, Gooding, Kyle, et al. (2016)	18 individuals with experience of depression and suicidality. <i>Age</i> = 33 (N/A), 44% female	Qualitative interviews	Sleep problems (Subjective participants' narratives, PSQI, SCI, SDSQ)	Suicidality (Subjective participant narrative, SSI)	Negative situational and self-appraisals, social isolation, rumination, entrapment	Thematic analysis	Sleep was perceived as contributing to suicidality via three interrelated pathways. Four key psychological processes were identified which underpin these pathways, namely, negative situational and self-appraisals, social isolation, rumination, entrapment.	8
Littlewood, Gooding, Panagioti, et al. (2016)	91 individuals with PTSD symptoms. <i>Age</i> = 28.87 (10.64), 73% female	Cross-sectional	Nightmares (Sum of item 2 ratings for intensity and severity from CAPS)	Suicidality (SBQ-R)	Defeat (Defeat scale); Entrapment (Entrapment scale); Hopelessness (BHS)	Mediation analysis	There was a significant indirect pathway whereby nightmares led to defeat, which led to entrapment, then hopelessness, and finally to suicidality. The direct relationship between nightmares and suicidality remained significant.	6
McCall, et al. (2013)	50 patients with depressive disorders. <i>Age</i> = 49 (N/A), 72% female	Cross-sectional	Insomnia (ISI); Nightmares (DDNSI)	Suicidal thoughts (SSI)	Negative sleep-related appraisals (DBAS-16)	Mediation analysis	Insomnia was indirectly related to suicidal thoughts through nightmares and dysfunctional beliefs and attitudes about	8

							sleep.	
Nadorff, et al. (2014) - Study 1	747 healthy undergraduate students. <i>Mage</i> = 18.9 (1.4), 57% female	Cross-sectional	Insomnia (ISI); Nightmares (DDNSI)	Suicidality (SBQ-R, reported a previous suicide attempt)	Acquired capability (ACSS-FAD); Perceived burdensomeness and thwarted belongingness (INQ)	Multiple linear regression and logistic regression	Insomnia was not related to suicidality when acquired capability for suicide, perceived burdensomeness and thwarted belongingness were controlled for. Nightmares were significantly related to suicidality after controlling for acquired capability, perceived burdensomeness and thwarted belongingness.	8
Nadorff, et al. (2014) - Study 2	604 healthy undergraduate students. <i>Mage</i> = 20.72 (4.15), 79.5% female	Cross-sectional	Insomnia (ISI); Nightmares (DDNSI)	Suicidal behaviour (series of questions adapted from the L-SASI)	Acquired capability (ACSS-FAD); Perceived burdensomeness and thwarted belongingness (INQ)	Multiple linear regression	Both insomnia and nightmares were related to suicidal behaviour, after controlling for acquired capability for suicide, perceived burdensomeness and thwarted belongingness.	8

Weis, et al. (2015)	460 healthy community-dwelling young adults. <i>Mage</i> = 25.6 (3.1), 74.1% female	Cross-sectional	Sleep quality (PSQI)	Suicidality (SBQ-R)	Emotion regulation (ERQ); rumination (subscale from the RSQ);	Structural equational modelling	Sleep problems were indirectly related to suicidality through depression severity, emotion regulation, and rumination.	5
Woosley, et al. (2014)	766 healthy community-dwelling. <i>Mage</i> = 53.78 (19.85), 50.8% female	Cross-sectional	Insomnia (identified against DSM-V criteria as documented in responses in 14-day sleep diary, ESS, FSS, IIS, BDI, and STAI)	Suicidal thoughts (Item 9 from BDI. Transformed into a dichotomous variable of present versus absent)	Hopelessness (Item 2 from BDI)	Mediation analysis	The indirect pathway by which hopelessness mediated the relationship between insomnia and suicidal thoughts was significant.	5
Zschoche and Schlarb (2015)	93 healthy adolescents. Aged 14 to 18 years, <i>Mage</i> = N/A, 69.9% female	Cross-sectional	Sleep quality (PSQI)	Suicidality (PSS)	Aggressive behaviour (Aggressive behaviour subscale from the FEPAA)	Mediation analysis	Aggressive behaviour did not significantly mediate the relationship between sleep problems and suicidality.	6

Note: NA, information not available in the article. PTSD= Post-traumatic Stress Disorder. Measures abbreviations, ACSS-FAD = Acquired Capability for Suicide Scale – Fearlessness about Death; ASQI= Adult Suicide Ideation Questionnaire; BDI = Beck Depression Inventory; BHS = Beck Hopelessness Scale; SSI = Beck Scale for Suicide Ideation; CAPS = Clinician-Administered PTSD Scale for DSM- IV; DSI-SS = Depressive Symptoms Inventory–Suicidality Subscale; DDNSI = Disturbing Dreams and Nightmare Severity Index; DBAS-16 = Dysfunctional Beliefs and Attitudes Scale- brief; ERQ = Emotion Regulation Questionnaire; ESS = Epworth sleepiness scale; FSS = Fatigue Severity Scale; FEPAA = German Questionnaire for Acquiring Empathy, Prosociality, Readiness for Aggression, and Aggressive Behavior; IIS = Insomnia Impact Scale; ISI = Insomnia Severity Index; INQ = Interpersonal Needs Questionnaire; L-SASI = Lifetime Suicide Attempt Self-Injury Interview; MFI = Multidimensional Fatigue Inventory; PSS = Paykel Suicide Scale; PSQI=Pittsburgh Sleep Quality Index; RSQ = Response Style Questionnaire; SCI = Sleep Condition Index; SDSQ = Sleep Disorders Screening Questionnaire; SPSI-R-SF = Social Problem Solving Inventory – Revised: Short Form; STAI-Y = State-Trait Anxiety Inventory- form Y; SBQ = Suicidal Behaviors Questionnaire; SBQ-R = Suicidal Behaviors Questionnaire Revised.

Three types of sleep-related variables were assessed with subjective measures, which were sleep quality (Littlewood, Gooding, Kyle, et al., 2016; Weis, et al., 2015; Zschoche & Schlarb, 2015), nightmares (Golding, et al., 2015; Hochard, et al., 2016; Littlewood, Gooding, Kyle, et al., 2016; Littlewood, Gooding, Panagioti, et al., 2016; Nadorff, et al., 2014), and insomnia (Bozzay, et al., 2016; Chu, et al., 2016; Golding, et al., 2015; Hochard, et al., 2016; McCall, et al., 2013; Nadorff, et al., 2014; Woosley, et al., 2014). However, none of the identified studies utilised objective measures of sleep. Furthermore, suicidality was operationalised across these twelve studies using eight different assessment tools, namely, The Adult Suicide Ideation Questionnaire (Reynolds, 1991), The Beck Scale for Suicide Ideation (Beck, Kovacs, & Weissman, 1979), The Suicidal Behaviors Questionnaire (Linehan, 1981), The Suicidal Behaviors Questionnaire-Revised (Osman, et al., 2001), The Paykel Suicide Scale (Paykel, Myers, Lindenthal, & Tanner, 1974), the Depressive Symptoms Inventory–Suicidality Subscale (Metalsky & Joiner Jr, 1997), the Lifetime Suicide Attempt Self-Injury Interview (Linehan & Comtois, 1996) and item 9 from the Beck Depression Inventory (Beck & Steer, 1987). There was much heterogeneity in the psychological factors investigated, which have been categorised broadly into four groups comprising cognitive appraisals, psychosocial factors, emotion regulation strategies, and risk behaviours. Eight studies investigated two or more psychological variables and were evaluated within each relevant category (Bozzay, et al.,

2016; Golding, et al., 2015; Hochard, et al., 2016; Littlewood, Gooding, Kyle, et al., 2016; Littlewood, Gooding, Panagioti, et al., 2016; Nadorff, et al., 2014; Weis, et al., 2015).

Finally, all quantitative studies conducted preliminary analyses to examine the relationship between sleep problems and suicidality (Bozzay, et al., 2016; Chu, et al., 2016; Golding, et al., 2015; Hochard, et al., 2016; Littlewood, Gooding, Panagioti, et al., 2016; McCall, et al., 2013; Nadorff, et al., 2014; Weis, et al., 2015; Woosley, et al., 2014; Zschoche & Schlarb, 2015). Thereafter, a range of analytical approaches were used to examine the influence of psychological factors on this relationship.

3.4.2. Study quality.

Quality ratings for the studies included in this review ranged between five and eight ($M = 6.8$), indicating that they were of moderate to high quality. Individual ratings for each study are included in Table 3.1. One of the key criticisms of wider research that has examined the relationship between sleep problems and suicidality, is the failure to include a measurement of depression (Bernert, Kim, et al., 2015). This is important given that sleep problems are highly prevalent in depression (Soehner, Kaplan, & Harvey, 2014; Tsuno, Besset, & Ritchie, 2005), and that there is a strong association between depression and suicidal thoughts and behaviours (Hawton, Casañas i Comabella, Haw, & Saunders, 2013; Oquendo, Currier, & Mann, 2006; Tarrier, et al., 2013). This is reflected in depression measures which generally include items relating to both sleep and suicidal thoughts and behaviours. Therefore, the role of depression should be quantified with the aim of ensuring that identified psychological factors are contributing to the sleep/suicide relationship, rather than the sleep/depression or depression/suicide relationships. It is noteworthy that ten of the quantitative studies identified in this review accounted for the role of depression, albeit with different approaches. Golding, et al. (2015) focused specifically on controlling for the impact of anhedonic symptoms of depression on analyses. The remaining nine quantitative studies either included depressive symptoms as an additional mediating variable (Weis, et al., 2015; Zschoche & Schlarb, 2015) or took

steps to statistically control for the impact of depressive symptoms or comorbid diagnoses of depression, within the main analyses (Bozzay, et al., 2016; Hochard, et al., 2016; Littlewood, Gooding, Panagioti, et al., 2016; McCall, et al., 2013; Nadorff, et al., 2014; Woosley, et al., 2014). The qualitative study sought to explicitly examine the interrelationships between depressive symptoms, sleep problems, and suicidality (Littlewood, Gooding, Kyle, et al., 2016). Finally, one quantitative study opted not to include a measure of depression within analyses based on the rationale that having accounted for variance in suicidality explained by depression, the remaining variance is largely error variance (Chu, et al., 2016).

3.4.3. Which psychological processes account for the association between sleep problems and suicidality?

3.4.3.1. Cognitive appraisals.

3.4.3.1.1. Hopelessness.

Three studies (Bozzay, et al., 2016; Littlewood, Gooding, Panagioti, et al., 2016; Woosley, et al., 2014) examined hopelessness within the context of the sleep/suicide relationship, although in different ways. First, using data from a cross-sectional study of a healthy community-dwelling sample, Woosley and colleagues (2014) tested a mediational pathway whereby the relationship between insomnia and suicidal thoughts was postulated to operate via hopelessness. Results indicated that hopelessness significantly mediated the relationship between insomnia and suicidal thoughts. One prominent strength of this study was the comprehensive measurement of insomnia against DSM-V criteria (Woosley, et al., 2014). However, as the authors acknowledge, the use of a single-item to measure hopelessness is problematic because it fails to capture the multi-dimensional nature of this construct (Beck, Weissman, Lester, & Trexler, 1974; Woosley, et al., 2014).

Second, Littlewood and colleagues (2016) (Littlewood, Gooding, Panagioti, et al., 2016) tested a theoretically driven (Williams, Crane, Barnhofer, & Duggan, 2005; Williams & Williams, 1997) mediational pathway, examining the relationship between

intensity and severity of nightmares and suicidality using a cross-sectional design with people who had symptoms of PTSD. As predicted, intensity and severity of nightmares were associated with suicidality indirectly through three serial mediators which were defeat, entrapment, and hopelessness. Here, hopelessness was identified as the third mediator within the pathway, and was indirectly related to nightmares via defeat first and then entrapment. There were two key strengths of the analysis strategy taken by this study. First, the pattern of results remained the same when analyses were repeated in a subset of participants without comorbid symptoms of depression, which indicates that this pathway operates independent of depression. Second, in the pursuit of isolating the specific pathway between nightmares and suicidality, comorbid insomnia was included as a control variable. However, findings are limited by the operationalisation of nightmares which was measured through the summation of two-items from the Clinician-Administered PTSD Scale for DSM- IV (Littlewood, Gooding, Panagioti, et al., 2016).

Third, hopelessness was included within a four-step mediational pathway, whereby severity of insomnia symptoms was related to suicidal thoughts through fatigue, then to appraisals of social problem-solving, and finally to hopelessness (Bozzay, et al., 2016). Hopelessness was posited to emerge from negative appraisals of social problem-solving, and subsequently trigger suicidal thoughts. A cross-sectional design with female undergraduate students was conducted to test the predicted pathways. Path analyses supported the hypothesis with greater severity of depressive symptoms also shown to heighten the relationships between appraisals of social problem-solving and hopelessness, and hopelessness and suicidal thoughts (Bozzay, et al., 2016). A key strength of this study was the combination of psychological theories and empirical evidence to develop a conceptual framework from which the association between insomnia and suicidal thoughts could be understood. In addition, validated scales were used to measure all variables. Conclusions are limited by the exclusively female non-clinical sample. Consequently, it

remains to be seen whether these pathways extend to both genders and to people who experience severe mental health problems.

3.4.3.1.2. Negative situational and self-appraisals.

To date, three studies have highlighted the role of negative situational and self-appraisals within the relationship between sleep problems and suicidal thoughts and behaviours (Bozzay, et al., 2016; Littlewood, Gooding, Kyle, et al., 2016; McCall, et al., 2013). First, a cross-sectional study (McCall, et al., 2013) focused on negative appraisals that specifically relate to sleep using the Dysfunctional Beliefs and Attitudes about Sleep Scale (Morin, Vallières, & Ivers, 2007). This 16-item scale consists of four subscales which assess beliefs about the consequences of insomnia; perceptions of worry and helplessness about sleep problems; expectations about sleep; and beliefs about the effects of sleep medication. McCall, et al. (2013) tested a mediational pathway whereby dysfunctional beliefs and attitudes about sleep, and nightmares, were predicted to mediate the relationship between severity of insomnia symptoms and suicidal thoughts, in people with depressive disorders. Bootstrapped mediational analyses indicated that the relationship between insomnia and suicidal thoughts was mediated by dysfunctional beliefs about sleep and the frequency and intensity of nightmares. However, the specific indirect effect via dysfunctional beliefs about sleep showed a trend towards significance (95% CI: -0.03 - 0.97). Methodologically, this study demonstrated high quality because it used validated scales to measure all study variables, and the determination of sample size through an *a priori* power calculation. Furthermore, the robust sampling strategy accounted for the possible presence of other underlying sleep disorders by excluding patients who had confirmed or suspected sleep apnea or restless leg syndrome. Future work examining negative beliefs about sleep should include supplementary mediational analyses of the subscales assessed by the Dysfunctional Beliefs and Attitudes about Sleep Scale, which may indicate if any particular type of negative sleep-related appraisals contribute to the sleep/suicide relationship.

Second, an exploratory, qualitative study examined the role of sleep in relation to suicidality, in people with experience of a major depressive episode(s) (Littlewood, Gooding, Kyle, et al., 2016). Different cognitive factors were identified in participant's narratives, including negative appraisals about current situations, and negative appraisals relating to the self. During the daytime, participants perceived that they had reduced cognitive abilities resulting from lack of sleep the previous night, which was associated with negative appraisals of self-worth. At night, situational appraisals concerning the lack of activity during night-time hours fuelled perceptions of isolation and loneliness, which perpetuated negative self-appraisals. Maximum variation sampling was used to effectively recruit participants who had experienced different types of sleep problems. Subsequently, the thematic analysis proposed core pathways which appeared to underpin the role of sleep in suicidality, rather than focusing on a specific type of sleep complaint. However, divergent findings indicate that the putative mechanisms which underpin the relationship between suicidality and nightmares, may differ to those which underpin the relationship between suicidality and insomnia (Golding, et al., 2015; Nadorff, et al., 2014).

Third, a cross-sectional study tested a conceptual model of the relationship between insomnia and suicidal thoughts which included appraisals of fatigue and social problem-solving ability (Bozzay, et al., 2016). Perceptions of fatigue were posited to negatively impact appraisals of social problem-solving due to the perception of reduced mental resources, which consequently increases the likelihood of avoiding problems, making impulsive judgements, and making greater reasoning errors (Bozzay, et al., 2016). As predicted, insomnia was related to suicidal thoughts through perceptions of fatigue, which led to negative appraisals of social problem-solving, and then led to hopelessness. Interestingly, the relationship between fatigue and social problem-solving did not vary as a function of depression severity, which indicates that negative self-appraisals may be driven by depleted energy and cognitive resources, rather than depressed mood.

3.4.3.1.3. Defeat and entrapment.

The negative effects of defeat and entrapment on suicidal thoughts and behaviours have been emphasised in numerous models of suicidal thoughts and behaviours (Johnson, et al., 2008; O'Connor, 2011; Williams, et al., 2005; Williams & Williams, 1997). A recent meta-analysis reported a strong effect size between perceptions of defeat and entrapment and suicidality (Siddaway, Taylor, Wood, & Schulz, 2015). Two studies included within this review examined defeat and entrapment in the context of the sleep/suicide relationship (Littlewood, Gooding, Kyle, et al., 2016; Littlewood, Gooding, Panagioti, et al., 2016). Drawing on the Cry of Pain model of suicide (Williams, et al., 2005; Williams & Williams, 1997), Littlewood and colleagues (2016) examined the role of perceptions of defeat, and entrapment in the relationship between nightmares and suicidality. As predicted, bootstrapped mediational analyses indicated that the relationship between nightmares and suicidality operated indirectly via three serial mediators of defeat, entrapment and hopelessness. The direct relationship between nightmares and suicidality remained significant, indicating that the outlined mediational pathways did not fully account for this relationship. Analyses were consistent when participants with comorbid depression were removed from the sample.

A subsequent qualitative study conducted by Littlewood, Gooding, Kyle, et al. (2016) sought to examine the role of sleep within suicidal pathways. Here, participants described a strong desire to use sleep to escape from the problems in their waking lives (Littlewood, Gooding, Kyle, et al., 2016). These narratives reflected perceptions of defeat, from which sleep provided an escape, as exemplified by this quote from one of the participants.

“...it feels like a blessed release that you’re unconscious for, how many hours and that you’re no longer thinking about your worthlessness and that you don’t want to exist.” (ID11, male)

This study highlights a pathway whereby failure to sleep appears to intensify perceptions of entrapment because an escape route involving sleep is continually prevented by insomnia.

A recent cross-sectional study in a non-clinical sample investigated the role of entrapment, but not defeat, in accounting for the sleep/suicide relationship (Hochard, et al., 2016). Two types of sleep problems were examined within this study, namely, current severity of insomnia symptoms and frequency and intensity of nightmares. Hierarchical regression models showed that current severity of insomnia symptoms and the frequency and intensity of nightmares failed to predict suicidal thoughts and plans, beyond that explained by depressive symptoms, entrapment, and acquired capability for suicide. However, there were significant interaction effects between both entrapment and severity of insomnia, and entrapment and frequency and intensity of nightmares, in predicting suicidal thoughts and plans (Hochard, et al., 2016). The methodological approach of this study was rated highly against the quality criteria, with prominent strengths including the use of power calculations to define the target sample size, validated measurement of study variables, and theoretically-driven, clearly defined, hypotheses. However, the analysis focusing on insomnia would have been strengthened by using nightmares as a control variable. Similarly, the analysis of nightmares would have been improved by the inclusion of insomnia as a control variable. These inclusions would have allowed the specific elements of sleep problems which amplify suicidal thoughts to be isolated.

3.4.3.1.4. Summary of research examining cognitive appraisals.

Collectively, there is strong evidence of the role of negative cognitive appraisals in the sleep/suicide relationship from six studies, of moderate (Littlewood, Gooding, Panagioti, et al., 2016; Woosley, et al., 2014) to high quality (Bozzay, et al., 2016; Hochard, et al., 2016; Littlewood, Gooding, Kyle, et al., 2016; McCall, et al., 2013). However, it is important to note that there is considerable heterogeneity between these six

studies, pertaining primarily to the measurement of different cognitive appraisals, and using different methodological approaches.

3.4.3.2. Psychosocial factors.

3.4.3.2.1. Perceived burdensomeness, thwarted belongingness and social isolation.

One of the most prominent contemporary models of suicide is the Interpersonal Theory of Suicide (ITS; Joiner, 2005; Van Orden, et al., 2010) which proposes that the simultaneous presence of two psychosocial factors of perceived burdensomeness and thwarted belongingness leads to desire for suicide. Perceived burdensomeness reflects both an individual's belief that they are a liability to others, coupled with perceptions of self-hatred (Van Orden, et al., 2010). The 'need to belong' is said to be a fundamental human need (Baumeister & Leary, 1995) and in instances where this need is unmet, it is suggested that this gives rise to feelings of thwarted belongingness (Van Orden, et al., 2010). Conceptually, both loneliness and the absence of reciprocally-caring relationships represent dimensions of thwarted belongingness. Four studies to date have directly tested the extent to which these psychosocial constructs from the ITS can account for the relationship between sleep problems (insomnia and nightmares) and suicidality (Chu, et al., 2016; Golding, et al., 2015; Nadorff, et al., 2014).

Nadorff and colleagues (2014) reported findings from two separate studies with different samples of healthy university students. In both studies, the frequency and intensity of nightmares significantly predicted suicidality, independent of perceived burdensomeness, thwarted belongingness and depressive symptoms. This indicates that the constructs defined within the ITS do not fully explain the relationship between nightmares and suicidality. However, the evidence for the severity of insomnia symptoms was less clear. Findings from the second study were consistent with those reported for nightmares, in that the relationship between insomnia and suicidal behaviours was significant, independent of perceived burdensomeness, thwarted belongingness, and depressive symptoms. In contrast, in the first study the relationship between insomnia and

suicidality was not significant when these three factors were added to the analysis model. These mixed findings suggest that the relationship between insomnia and suicidality may be mediated by the variables outlined within the IPTS but only under specific circumstances. For instance, the authors suggested that the duration of insomnia symptoms may drive the association between insomnia and suicidality in university samples (Nadorff, Nazem, & Fiske, 2013). Therefore, differences between patterns of results for study 1 and study 2 may stem from differences in the duration of insomnia experienced by the different samples (Nadorff, et al., 2014). Based on the evaluation against the quality criteria, these two studies were assessed as being of a high methodological quality with the use of clear, theoretically based, research questions to be commended (Nadorff, et al., 2014).

Members of the same research group recently conducted a similar study but with an older sample of adults aged 55 to 75 years (Golding, et al., 2015). In addition to measuring the severity of insomnia symptoms and frequency and intensity of nightmares, the duration with which participants had experienced symptoms of insomnia and nightmares was also assessed. Using hierarchical regression analyses, perceived burdensomeness and thwarted belongingness were added into the first step of the model, followed by insomnia symptoms and frequency and severity of nightmares into the next step, and nightmare duration and insomnia duration were entered into the last step of the model. Consistent with the studies by Nadorff, et al. (2014), nightmare duration and nightmare symptoms significantly predicted suicidality, independent of the IPTS constructs and insomnia. However, neither symptoms of insomnia nor insomnia duration significantly predicted suicidality, after controlling for the IPTS variables (Golding, et al., 2015). This patterns of results are in line with those from Nadorff and colleagues (2014) study 1, and suggest that the IPTS variables may account for the insomnia/suicidality relationship. In extending the earlier work conducted by Nadorff, et al. (2014), this later study demonstrated the same methodological rigour in testing theory-driven hypotheses,

and simultaneously controlling for duration and symptoms of different types of sleep problems.

A study carried out in South Korea focused solely on the mediational role of thwarted belongingness, based on the empirical evidence that insomnia appears to be associated with increased feelings of loneliness (Chu, et al., 2016). Accordingly, they conducted a cross-sectional questionnaire study with undergraduate students to examine the extent to which thwarted belongingness mediated the relationship between severity of insomnia symptoms and suicidal thoughts. As predicted, the relationship between insomnia severity and suicidal thoughts was mediated by thwarted belongingness (Chu, et al., 2016). This research provides further evidence that the association between insomnia and suicidality may function via variables described by the IPTS, and specifically by thwarted belongingness (Chu, et al., 2016; Golding, et al., 2015; Nadorff, et al., 2014). Merits of this study include the theoretical and empirically based hypotheses and utilisation of validated questionnaires. However, replication in clinical samples is necessary. The role of social isolation in explaining the link between sleep problems and suicidality was highlighted in the qualitative study included within this review (Littlewood, Gooding, Kyle, et al., 2016). The importance of social support in buffering suicidal thoughts and behaviours was emphasised by these participants, and consequently, social isolation was seen as contributing to suicidality. When participants were awake in the night they felt isolated from friends and family members. Seemingly, night-time acted as a barrier, preventing them from gaining social support and also fed into participants' sense of loneliness. Participants also recognised that isolation from social support provided an opportune time for suicide attempts, as there was a reduced chance of intervention from a family member or friend during the night-time. Social isolation was also acknowledged as a daytime consequence of poor sleep the previous evening. Participants subsequently felt irritable and had low energy, which both deterred them from seeking social interactions and threatened the continuation of social relationships.

3.4.3.2.2. Summary of research examining psychosocial factors.

In summary, the role of psychosocial factors in relation to the association between sleep problems and suicidality is unclear. Differences in findings between studies examining insomnia and nightmares indicate that the role of psychosocial factors may differ as a function of the specific type of sleep problem being experienced. For instance, consistently across three cross-sectional studies, the relationship between nightmares and suicidality operated independently of thwarted belongingness and perceived burdensomeness (Golding, et al., 2015; Nadorff, et al., 2014). In contrast, mixed findings indicated that social isolation or thwarted belongingness (Chu, et al., 2016; Golding, et al., 2015; Littlewood, Gooding, Kyle, et al., 2016; Nadorff, et al., 2014) and perceived burdensomeness (Nadorff, et al., 2014) may partially account for the relationship between insomnia symptoms and duration, and suicidality. The five studies that examined psychosocial factors in the sleep/suicide relationship were all appraised as being of high quality.

3.4.3.3. Emotion regulation strategies.

3.4.3.3.1. Rumination and emotional regulation.

The current review identified one cross-sectional quantitative study which examined the interrelations between sleep quality, suicidality, and emotion regulation strategies, namely, rumination, cognitive reappraisal, and expressive suppression (Weis, et al., 2015). In this study, rumination was conceptualised as a cognitive process, whilst in the wider literature rumination has been described as a maladaptive form of coping and emotion regulation (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Conceptually, rumination can be described as repeatedly thinking about the causes and consequences of an individual's negative emotional state. Cognitive reappraisal refers to modifying the ways in which a stressor is evaluated. Expressive suppression reflects the ability to inhibit the outward expression of emotional states (Aldao, et al., 2010). Cognitive reappraisal and

expressive suppression were measured using the Emotion Regulation Questionnaire (Gross & John, 2003). Cognitive reappraisal is considered to be a more positive strategy and expressive suppression has been acknowledged to represent a maladaptive emotion regulation strategy (Aldao, et al., 2010), although this may be culturally specific (Soto, Perez, Kim, Lee, & Minnick, 2011). Despite this, the authors chose not to analyse the two subscales separately, and instead performed analysis on the total scale score as an overall measure of emotion regulation. Preliminary analyses indicated which study variables predicted suicidality. Different models composed of the significant predictors of suicidality were compared. The best-fitting model indicated that the relationship between poor sleep quality and suicidality operated indirectly through rumination, depression, and emotional regulation as parallel mediators. Furthermore, the relationship between emotional regulation and suicidality also functioned indirectly through depression, and rumination. Methodologically, a clear strength of the study by Weis and colleagues (2015) was the use of validated scales to measure all study variables. Although this study provided evidence to support the role of rumination within the sleep quality/suicide relationship, the specific roles of cognitive reappraisal and expressive suppression were unclear. In addition, the failure to provide a rationale for the sample size and the absence of important statistical information, such as confidence intervals, were reflected in the moderate quality rating (see Table 3.1).

Finally, in the only qualitative study, disturbed sleep contributed to rumination because participants felt less able to distract themselves from negative, repetitive, thought processes (Littlewood, Gooding, Kyle, et al., 2016). However, it was not clear from participant's quotes or supporting narratives whether individuals were describing rumination or a form of more general negative thinking. Consequently, implications of these findings are limited.

3.4.3.3.2. Summary of research examining emotion regulation strategies.

Two studies included within this review provided tentative evidence that emotion regulation strategies may partially account for the association between sleep problems and suicidality (Littlewood, Gooding, Kyle, et al., 2016; Weis, et al., 2015). However, conclusions from these findings must be tempered because they are based on only two studies, and the qualitative study failed to provide data which clearly depicted rumination. Further, research has yet to examine the individual contribution of different types of emotion regulation strategies to sleep/suicide relationships.

3.4.3.4. Risk behaviours.

3.4.3.4.1. Acquired capability for suicide

Whilst two psychosocial constructs of the IPTS, that is, perceived burdensomeness and thwarted belongingness, are said to trigger the desire for death by suicide, the third construct, ‘acquired capability for suicide’, is posited to account for the transition from suicidal desire to making suicide attempts (Joiner, 2005; Van Orden, et al., 2010). Here, both a lowered fear of death and an elevated tolerance for physical pain are purported to develop via habituation in response to repeated exposure to painful and life-threatening or fear-inducing experiences (Van Orden, et al., 2010). Acquired capability for suicide was investigated by four studies in the context of the sleep/suicide relationship.

Three studies, published in two papers, conducted by members of the same research group, sought to examine whether the relationship between sleep problems and suicidality could be accounted for by the IPTS (Golding, et al., 2015; Nadorff, et al., 2014). Collectively, findings from these studies indicated that sleep problems were related to suicidality, independent of acquired capability for suicide (Golding, et al., 2015; Nadorff, et al., 2014). Hochard and colleagues (2016) proposed alternative hypotheses whereby acquired capability was posited to interact with both severity of insomnia symptoms and the frequency and intensity of nightmares, to predict suicidal thoughts. Indeed, hierarchical regression models confirmed these predictions, showing that the

interactions between both acquired capability and insomnia symptoms, and acquired capability and nightmares, accounted for additional variance in suicidal thoughts beyond the effect of depressive symptoms (Hochard, et al., 2016). In this study, acquired capability was operationalised as deliberate self-harm which is less precise compared to the conceptualisation used by Joiner and colleagues (Joiner, 2005; Van Orden, et al., 2010). Whilst frequency of self-harm has been shown to predict greater levels of acquired capability for suicide (Willoughby, Heffer, & Hamza, 2015), this is not the sole mechanism by which people develop the capability for suicide (Van Orden, et al., 2010). Therefore, replication of these findings using The Acquired Capability for Suicide Scale (Van Orden, Witte, Gordon, Bender, & Joiner Jr, 2008) is warranted.

3.4.3.4.2. Aggressive behaviour.

A hypothesised mediational pathway was tested by Zschoche and Schlarb (2015) who predicted that the relationship between sleep quality and suicidality would operate indirectly through aggressive behaviour and depression. A sample of adolescents aged between 14 and 18 years completed self-report measures of sleep quality, suicidality, aggressive behaviour, and depression. The mediational model indicated that the relationship between sleep quality and suicidality was partially mediated by depression, but not aggressive behaviour. However, the direct relationship between sleep quality and suicidality remained significant.

3.4.3.4.3. Summary of research examining risk behaviours.

Four of the identified studies suggest that the relationship between sleep problems and suicidality is unlikely to function via acquired capability for suicide (Golding, et al., 2015; Nadorff, et al., 2014) nor aggressive behaviour (Zschoche & Schlarb, 2015). The fifth study took an alternative approach to show that the interaction between sleep problems and acquired capability predicted increased suicidal thoughts (Hochard, et al., 2016). Although the quality of this evidence was rated as moderate (Zschoche & Schlarb, 2015) to high (Golding, et al., 2015; Nadorff, et al., 2014), given that this divergent

evidence is based on a small number of studies all of which were conducted with non-clinical samples, it would be inappropriate to discount the role of risk behaviours at this point.

3.5. Discussion

A clear, and impactful, finding of this systematic review was that the empirical literature examining the role of psychological factors that underpin the relationship between sleep problems and suicidality is in its infancy. An important aspect of this review was the critical evaluation of the evidence against six criteria quantifying the quality of the methodology and analyses used by each of the studies. Whilst all of the studies were judged to be of moderate to high quality, it is important to remember that this is based on quality criteria specific to cross-sectional and qualitative designs. The predominant use of cross-sectional designs limits interpretation of the directionality of posited pathways. Although mediational analyses are commonly conducted within cross-sectional designs, it should be noted that no temporal or causal relationships can be inferred from this data (Winer, et al., 2016). Rather, studies evaluated by this review utilised mediational analyses to account for the shared relationships between psychological factors, sleep problems, and suicidal thoughts and behaviours. These findings provide the groundwork from which alternative designs, such as prospective, longitudinal, experience sampling, and experimental methods, can examine the putative pathways highlighted by this review.

The identified literature solely focused on subjective measures of sleep, and is yet to examine specific complexities of sleep, such as sleep stages, continuity and circadian patterning, and hence would benefit from objective measurement of sleep via polysomnography or actigraphy. More broadly, objective sleep disturbance has been shown to be associated with both suicidal thoughts and behaviours (Agargun & Cartwright, 2003; Ballard, et al., 2016; Keshavan, et al., 1994; Sabo, Reynolds, Kupfer, & Berman, 1991) and mental health problems (Baglioni, et al., 2016). Quantitative research

would benefit from measuring different parameters of sleep and sleep problems, and from including adjustments in data analyses to establish the independent contribution of each of the different facets of sleep (e.g., continuity, quality) in conferring risk for suicidal thoughts and behaviours. Furthermore, given the growing evidence showing that people who experience suicidal thoughts also report suicidal imagery (Hales, Deeptose, Goodwin, & Holmes, 2011), future research should examine the relationship between nightmare and dream content in relation to suicidal thoughts and behaviour. It is possible that suicidal imagery during sleep may trigger or intensify perceptions of entrapment or hopelessness for an individual, due to the uncontrollable nature of dream and nightmare content.

Although research studies have reported significant associations between suicidality and a range of sleep problems, including insomnia, nightmares, and poor sleep quality (Bernert, Kim, et al., 2015; Malik, et al., 2014; Pigeon, et al., 2012), evidence from this review suggests that the psychological factors which underpin these relationships may differ as a function of the specific sleep problem which is being experienced (Golding, et al., 2015; McCall, et al., 2013; Nadorff, et al., 2014). However, findings from the only qualitative study included in this review described core pathways thought to underpin the relationship between suicidality and different types of sleep problems, including social isolation, defeat and entrapment (Littlewood, Gooding, Kyle, et al., 2016). Future empirical work should seek to ascertain whether the identified psychological factors represent core, transdiagnostic, mechanisms which underpin the sleep/suicide relationship.

Related to this, it is important for work in this area to extend the current linear, unidirectional focus predominantly taken to investigate bi-directional pathways between sleep problems, suicidality and psychological factors. The negative daytime consequences of sleep problems have been postulated to have an adverse effect on sleep quality the following night, (Harvey, 2008). Hence, future studies should examine, not only the effects of poor sleep on suicidal thoughts, but also the degree to which suicidal thinking affects quality of sleep.

Regardless of the methodological issues inherent in the identified literature, there is sufficient initial evidence to indicate that negative cognitive appraisals, social isolation, and unhelpful coping and emotion regulation strategies may partially account for the sleep/suicide relationship. Furthermore, it is reassuring that the quality of the methodology and analytical approach taken within the reviewed studies were rated as moderate to high. Notably, ten of the eleven studies sought to quantify the role of depression when examining interrelationships between sleep, suicidal behaviour and psychological factors. Future research should establish the extent to which aspects of specific mental health problems may moderate the role of identified psychological factors in the context of the sleep/suicide relationship.

It is important to integrate the findings of this review with contemporary models of suicidal thoughts, plans and behaviours so that these models can be further developed and tested in the context of sleep disorders. A visual schematic diagram of the integrated theoretical and empirical findings are presented in Figure 3.2. This figure represents the pathways largely using causal, unidirectional, pathways based on the interpretation provided in the literature. As all of the studies included in this review used cross-sectional designs it will be important in future studies to test bi-directional, cyclical, temporal, and causal relationships. For instance, it is possible that suicidal thinking may delay sleep onset, and hence cause or reinforce sleep disturbance.

3.5.1. The role of psychological processes in the sleep/suicidality relationship.

3.5.1.1. Cognitive appraisals.

Taken together, empirical findings from six studies suggested that cognitive appraisals may play a key role in explaining the relationship between sleep problems and suicidal thoughts and behaviours. Specifically, four multi-step pathways could be identified from the review which incorporated five types of negative cognitive appraisals, namely, hopelessness, defeat, entrapment, and situational and self-appraisals (see Figure 3.2).

First, a two-step pathway can be posited, whereby sleep problems trigger hopelessness, which in turn leads to suicidal thoughts (Woosley, et al., 2014). Hopelessness has been shown to be one of the strongest predictors of suicidal thoughts and behaviours (O'Connor & Nock, 2014). However, empirical evidence implies that hopelessness does not fully explain the relationship between sleep problems and suicidal thoughts and behaviours (Ribeiro, et al., 2012; Winsler, Deutsch, Vorona, Payne, & Szklo-Coxe, 2015). Alternatively, hopelessness may operate alongside other mechanisms to explain the link between sleep and suicidality (Bozzay, et al., 2016; Littlewood, Gooding, Panagioti, et al., 2016).

Second, a significant four-step mediational pathway was reported whereby nightmares led to perceptions of defeat, entrapment, hopelessness and finally to suicidal thoughts and behaviour (Littlewood, Gooding, Panagioti, et al., 2016). The central role of defeat and entrapment in suicidality is emphasised within contemporary theoretical models of suicidal thoughts and behaviours (Johnson, et al., 2008; O'Connor, 2011; Williams, et al., 2005; Williams & Williams, 1997) and the broader empirical literature (Siddaway, et al., 2015). In addition, theoretical and empirical evidence suggests it may be prudent to expand work relating to defeat to examine the role of inferiority (Gilbert & Allan, 1998; Lee, et al., 2010). Theoretically, inferiority is posited to emerge from perceptions of having a low social ranking in comparison to others (Gilbert & Allan, 1998). Data from a large cross-sectional study indicated that inferiority predicts suicidal thoughts, independent of insomnia, depression, anxiety, unemployment and hostility (Lee, et al., 2010). Empirically, conceptual commonalities and divergences between perceptions of inferiority and defeat in relation to suicidal thoughts and behaviours have yet to be identified.

The third pathway reflects that sleep problems, such as insomnia or nightmares, may contribute to increased suicidal thoughts via their interaction with perceptions of

entrapment (Hochard, et al., 2016). In this sense, nightmares and insomnia are posited to act as moderators, intensifying the association between entrapment and suicidality.

Fourth, a pathway was identified from sleep problems to negative situational and self-appraisals, which in turn were associated with suicidal thoughts and behaviours (Littlewood, Gooding, Kyle, et al., 2016; McCall, et al., 2013). This is consistent with the Schematic Appraisals Model of Suicide (SAMS; Johnson, et al., 2008) which posits that negative situational and self-appraisals are particularly deleterious within suicide pathways, as both can trigger perceptions of defeat and entrapment, from which suicidal thoughts are posited to emerge (see Figure 3.2). Specifically, perceptions of defeat and entrapment were shown to mediate the relationship between self-appraisals of emotional-coping and social problem-solving ability, and suicidal behaviour in individuals who had experienced trauma (Panagioti, Gooding, Taylor, & Tarrier, 2012). Although both situational and self-appraisals are broad concepts, proponents of the SAMS highlight the specific relevance of three types of self-appraisals, namely, evaluations of personal attributes (such as self-esteem), cognitive-emotional abilities (such as perceptions of social problem-solving and emotional coping) and the perceived ability to draw upon social support (Johnson, et al., 2008).

Indeed, evidence for the fifth pathway encompassed appraisals of social problem-solving, and suggested that insomnia led to perceptions of fatigue, which contributed to negative appraisals of social problem-solving, which triggered perceptions of hopelessness, from which suicidal thoughts emerged (Bozzay, et al., 2016). The pathways which have been identified represent an excellent starting point but, they now must be tested with the goal of establishing convergent evidence generated from the use of different methodological approaches. Future research would benefit from investigating the ways in which sleep problems interact with the specific appraisals suggested as being key to pathways to suicidal thoughts and behaviours (see Figure 3.2).

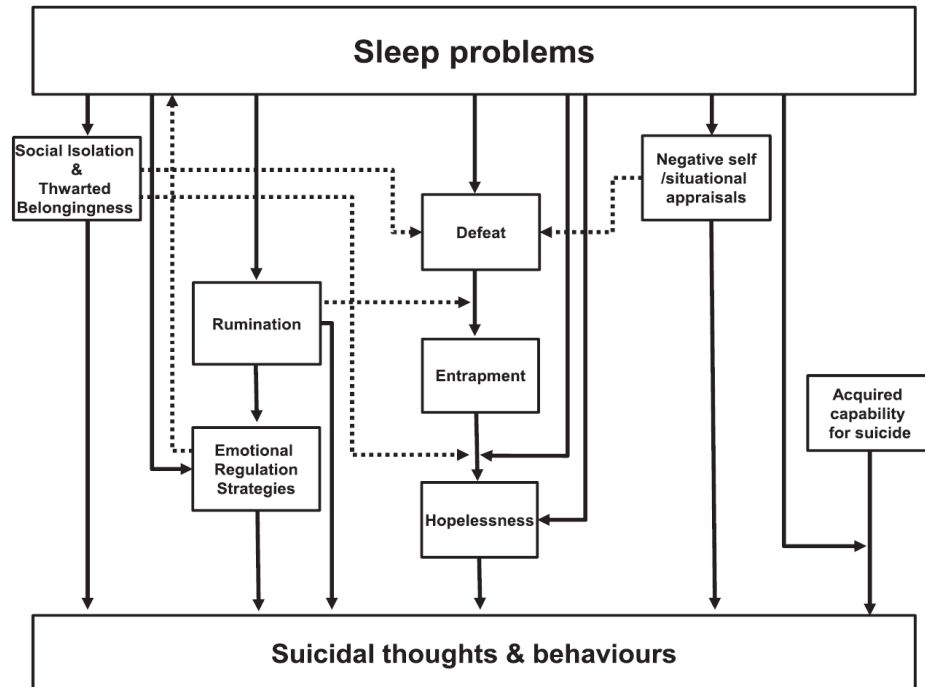


Figure. 3.2. Solid lines depict mediational or moderational pathways from the review findings, and dotted lines indicate additional pathways as predicted by contemporary models of suicide.

3.5.1.2. Psychosocial factors.

Convergent qualitative and quantitative results have shown that social isolation or thwarted belongingness may account for the relationship between sleep and suicidal thoughts and behaviours (see Figure 3.2; Chu, et al., 2016; Golding, et al., 2015; Littlewood, Gooding, Kyle, et al., 2016; Nadorff, et al., 2014). This is in agreement with findings from the broader literature. For example, people with insomnia reportedly feel isolated due to lack of understanding from friends or family, disengage from social activities due to fatigue, and fail to seek social support (Henry, Rosenthal, Dedrick, & Taylor, 2013; Kyle, Espie, & Morgan, 2010). Furthermore, social isolation has been identified as one of the strongest predictors of suicidal thoughts and behaviours, and is said to be indicative of thwarted belongingness (Van Orden, et al., 2010). However, there was divergent data from four cross-sectional studies (Chu, et al., 2016; Golding, et al., 2015; Nadorff, et al., 2014), with three providing evidence to suggest that thwarted

belongingness may account for the insomnia/suicidality relationship (Chu, et al., 2016; Golding, et al., 2015; Nadorff, et al., 2014). In contrast, Nadorff and colleagues' (2014) study 2 reported a significant association between insomnia and suicidality, beyond thwarted belongingness. The authors provided one possible explanation for the mixed quantitative findings, speculating that sample differences between duration of insomnia symptoms may account for the divergent pattern of results (Nadorff, et al., 2014). Indeed, previous research has indicated that duration of insomnia is associated with suicidality in university students, independent of insomnia symptoms (Nadorff, Nazem, et al., 2013). This possibility should be examined to quantify the extent to which the interrelationships between insomnia, suicidality, social isolation and thwarted belongingness, vary as a function of duration of insomnia.

From the perspective of the SAMS, social isolation can be understood as a negative appraisal of social support, and hence, is posited to be indirectly related to suicidal thoughts and behaviours via perceptions of defeat and entrapment (see Figure 3.2; Johnson, et al., 2008; Taylor, Wood, Gooding, & Tarrier, 2010). Alternatively, the Integrated Motivational-Volitional model (IMV) postulates that negative appraisals of social support interact with entrapment to predict suicidal thoughts (see Figure 3.2; O'Connor, 2011). These hypotheses should be examined with different types of path analyses, such as moderated mediational modelling, to develop a greater understanding of the role of social isolation in the sleep problem/suicide relationship.

3.5.1.3. Emotion regulation strategies.

Three pathways could be identified from this review which incorporate the emotion regulation strategies of rumination, cognitive reappraisals, and expressive suppression see Figure 3.2 (Littlewood, Gooding, Kyle, et al., 2016; Weis, et al., 2015). There was convergent, albeit tentative, evidence from two studies (Littlewood, Gooding, Kyle, et al., 2016; Weis, et al., 2015) regarding a possible mediating role of rumination, in the relationship between sleep problems and suicidality. This is bolstered by the wider

literature which shows that pre-sleep rumination is associated with delayed sleep onset (Pillai, Steenburg, Ciesla, Roth & Drake), and that rumination is associated with suicidal thoughts and behaviours (Morrison & O'Connor, 2008). Furthermore, repeatedly thinking about suicide may prevent healthy sleep and also contribute to vital exhaustion (Kerkhof & van Spijker, 2011). Subsequently, the failure to escape suicidal thoughts via sleep may then reinforce and intensify suicidal thinking. Theoretically, the IMV postulates that rumination acts as a moderator in suicidal pathways, whereby ruminative processes strengthen the relationship between defeat and entrapment (see Figure 3.2; Dhingra, Boduszek, & O'Connor, 2016; O'Connor, 2011). This should be tested further with a moderated-mediational model to examine whether rumination acts as a mediator of the relationship between sleep problems and suicidality, or as a moderator of the relationship between defeat and entrapment.

Two further significant pathways were reported by Weis, et al. (2015). First, the association between sleep problems and suicidality operated indirectly through cognitive reappraisal and expressive suppression. Second, a significant three-step pathway indicated that the association between sleep problems and suicidality operated indirectly, first, through cognitive reappraisal and expressive suppression, which were considered together, then to rumination (Weis, et al., 2015). Consistent with this, poor sleepers have found it more difficult to implement cognitive reappraisal strategies than good sleepers (Mauss, Troy, & LeBourgeois, 2013). Additional studies should seek to examine the separate contribution of these two types of emotion regulation strategies, given that cognitive reappraisal is considered to be an adaptive process which is protective of mental health problems, whilst expressive suppression may be viewed as maladaptive (Aldao, et al., 2010), and associated with greater levels of mental health problems in some contexts (Soto, et al., 2011). Furthermore, it is important to acknowledge the possible bidirectional relationship between emotional dysregulation and sleep disturbance (Harvey, Murray, Chandler, & Soehner, 2011). A challenge for future research projects is to develop ways

of rigorously testing unidirectional and bidirectional pathways involving sleep, emotional regulation, and suicidality.

3.5.1.4. Risk behaviours.

Research examining the role of risk behaviours in relation to sleep problems and suicidal thoughts and behaviours has thus far examined ‘acquired capability for suicide’ (Golding, et al., 2015; Hochard, et al., 2016; Nadorff, et al., 2014) and aggressive behaviour (Zschoche & Schlarb, 2015). There was mixed evidence to support a role of acquired capability for suicide in accounting for the relationship between sleep problems and suicidality. Three studies reported non-significant findings (Golding, et al., 2015; Nadorff, et al., 2014) and a single study (Hochard, et al., 2016) showed significant interaction effects between insomnia and acquired capability, and nightmares and acquired capability, in relation to suicidal thoughts, albeit using a measure of deliberate self-harm as an indicator of acquired capability, as opposed to a scale constructed to measure this construct. However, the findings of Hochard and colleagues (2016) fit with recent cross-sectional and longitudinal studies which indicated that acquired capability for suicide significantly interacted with states of hyperarousal³, such as sleep disturbance, to predict both suicidal thoughts (Ribeiro, Silva, & Joiner, 2014) and death by suicide (Ribeiro, Yen, Joiner, & Siegler, 2015), independent of depression. Specifically, hyperarousal amplified suicidal thoughts and risk in individuals with high levels of acquired capability for suicide. However, there was no interaction between low capability for suicide and hyperarousal. In order to advance our understanding in this area, subsequent work should seek to examine the specific independent moderating effects of sleep problems, as a form of hyperarousal, on the relationship between acquired capability for suicide and suicidality (see Figure 3.2).

Evidence from the single study included in this review reported that aggressive behaviour did not account for the relationship between sleep problems and suicidality (Zschoche & Schlarb, 2015). This is surprising as sleep problems are a risk factor for

³ Studies excluded from review because sleep disturbance was operationalised as part of overarousal, hence it was not possible to isolate relationships specific to sleep.

aggressive behaviour (Kamphuis, Meerlo, Koolhaas, & Lancel, 2012) and aggression has been associated with suicidal behaviours (Gvion & Apter, 2011). Aggressive behaviour only reflects one facet of aggression. Consequently, examination of the role of different aspects of aggression relative to the sleep/suicide relationship is warranted. For instance, hostility may reflect feelings of irritability or anger, but may not necessarily result in aggressive behaviour. Hostility has been associated with a greater risk of suicidal thoughts and behaviours (Ferraz, et al., 2013; Jeon, et al., 2013; Zhang, et al., 2012), and was found to predict suicidal ideation, independent of insomnia (Lee, et al., 2010).

3.5.2. Clinical implications.

This review highlights the need to collect further evidence to facilitate the future development of effective clinical interventions (Craig, et al., 2008). Whilst it would be premature to make suggestions concerning the directions that such interventions should take, four implications for clinical practice are evident. First, when working with clients exhibiting suicidal thoughts and behaviours it is important to assess and monitor co-occurring sleep problems using measures and scales with established psychometric properties. Second, our review suggests that restoration of healthy sleep could be beneficial to suicidal clients, particularly in conjunction with interventions targeted at resolving negative cognitive appraisals. Third, the present studies highlighted interrelations between sleep problems, social isolation and suicidality (Chu, et al., 2016; Golding, et al., 2015; Littlewood, Gooding, Kyle, et al., 2016; Nadorff, et al., 2014). Establishing access to social support both during day-time and night-time hours may help to reduce vulnerability for suicidal thoughts and behaviours. Fourth, comorbid sleep problems increased suicidality in individuals who displayed high capability for suicide (Hochard, et al., 2016). Consequently, improving the sleep of this high-risk group may reduce vulnerability to suicide in the short-term, and permit therapeutic techniques to be used more effectively, when a greater attentional load is placed upon clients' cognitive-evaluative skills (Tarrier, et al., 2013). In terms of appropriate sleep interventions,

cognitive behavioural therapy for insomnia has been shown to effectively reduce insomnia symptoms (Wu, et al., 2015), and suicidal thoughts (Trockel, et al., 2015). No comparative studies have been conducted to examine the impact of nightmare-targeted treatments on co-occurring suicidality.

3.5.3. Strengths and limitations of the review.

There were four major strengths of the current review. First, one of the most important strengths is the novel theoretical contribution by integrating initial empirical findings with contemporary psychological models of suicide to identify ways in which these models can be optimally developed to provide explanations of the relationship between sleep problems and suicidal thoughts and behaviours. It also illustrates where predictions differ across these psychological models, and indicates ways in which differentiable hypotheses can be generated. Second, the systematic search strategy was informed by the PRISMA statement, and comprehensive search terms were used which encompassed both text and MeSH terms that were customised for use with each of four major bibliographic databases. Third, existing tools which evaluate the methodological quality of studies were adapted to enable the systematic appraisal of quantitative and qualitative papers against six comparable quality criteria. Fourth, the last author conducted reliability checks to ensure rigour of both the screening process and the critical evaluation of the methodological quality of the identified studies. Hence, this review makes a number of important theoretical and clinical contributions, and used robust procedures to ensure methodological rigor.

Three limitations of the review should be considered. First, intentionally inclusive sampling criteria resulted in the inclusion of studies with wide ranging samples, covering healthy, clinical, adolescent and adult populations. It is important for future work to ascertain the extent to which the proposed pathways can account for the sleep/suicide relationship across different clinical and non-clinical populations. Second, the inclusion criteria were restricted to studies published in English-language, peer-reviewed journals.

This may have limited the results by excluding the grey literature (e.g., Department of Health reports in the UK) or those not published in English. That said, one clear benefit of the peer-review process is that it acts as a quality control mechanism (Campanario, 1998). Furthermore, it remains challenging to systematically search literature published outside of peer-reviewed journals which are not routinely included within all bibliographic resources (Bellefontaine & Lee, 2014). Third, review findings were integrated with psychological theory to develop a research agenda to guide future empirical investigation. Whilst outside of the scope of the current review, it may also prove fruitful to examine the evidence base for psychological factors which have established associations with i) sleep problems, and ii) suicidal behaviours, but which have not yet been investigated in the context of the sleep/suicide relationship.

3.6. Conclusion

It is clear that sleep problems are related to suicidal thoughts and behaviours. However, research examining the psychological processes that may underpin this relationship is at an early stage. Preliminary evidence suggests that the relationship between sleep problems and suicidal thoughts and behaviours may function via three types of psychological factors which are negative cognitive appraisals (Bozzay, et al., 2016; Littlewood, Gooding, Panagioti, et al., 2016; McCall, et al., 2013; Woosley, et al., 2014), social isolation and thwarted belongingness (Chu, et al., 2016; Golding, et al., 2015; Littlewood, Gooding, Kyle, et al., 2016; Nadorff, et al., 2014), and emotion regulation strategies (Weis, et al., 2015) (Littlewood, Gooding, Kyle, et al., 2016). Additionally, a single study reported an interaction effect between sleep problems and acquired capability for suicide in relation to suicidality (Hochard, et al., 2016). Theoretically, this resonates with elements of four contemporary models of suicidal behaviour, the IPTS (Joiner, 2005; Van Orden, et al., 2010), the IMV (O'Connor, 2011), and the SAMS (Johnson, et al., 2008). Furthermore, integration of the review findings with relevant aspects from these contemporary theories, allowed the development of a clear research agenda (see Figure

3.2) from which longitudinal, experience sampling, and experimental designs should be utilised to generate convergent evidence. Clinically, investigating the role of psychological processes in pathways which link sleep problems and suicidality is fundamental to the development of suicide prevention interventions. Whilst it would be premature to suggest specific interventions, it would seem prudent for clinicians to consider evaluating and managing sleep problems in the context of suicidality.

3.7. References

- Agargun, M. Y., & Besiroglu, L. (2005). Sleep and suicidality: do sleep disturbances predict suicide risk? *Sleep*, 28, 1039-40.
- Agargun, M. Y., & Cartwright, R. (2003). REM sleep, dream variables and suicidality in depressed patients. *Psychiatry Research*, 119, 33-9.
- Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, 30, 217-37.
- Baglioni, C., Battagliese, G., Feige, B., Spiegelhalder, K., Nissen, C., Voderholzer, U., Lombardo, C., & Riemann, D. (2011). Insomnia as a predictor of depression: a meta-analytic evaluation of longitudinal epidemiological studies. *Journal of Affective Disorders*, 135, 10-19.
- Baglioni, C., Nanovska, S., Regen, W., Spiegelhalder, K., Feige, B., Nissen, C., Reynolds III, C. F., & Riemann, D. (2016). Sleep and Mental Disorders: A Meta-Analysis of Polysomnographic Research. *Psychological Bulletin*.
- Ballard, E. D., Vande Voort, J. L., Bernert, R. A., Luckenbaugh, D. A., Richards, E. M., Niciu, M. J., Furey, M. L., Duncan, W. C., Jr., & Zarate, C. A., Jr. (2016). Nocturnal Wakefulness Is Associated With Next-Day Suicidal Ideation in Major Depressive Disorder and Bipolar Disorder. *The Journal of Clinical Psychiatry*, 77, 825-31.
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117, 497.
- Beck, A. T., Kovacs, M., & Weissman, A. (1979). Assessment of suicidal intention: the Scale for Suicide Ideation. *Journal of Consulting and Clinical Psychology*, 47, 343.
- Beck, A. T., & Steer, R. A. (1987). *Beck Depression Inventory*. Orlando, FL: Psychological Corporation.
- Beck, A. T., Weissman, A., Lester, D., & Trexler, L. (1974). The measurement of pessimism: the hopelessness scale. *Journal of Consulting and Clinical Psychology*, 42, 861-5.
- Bellefontaine, S. P., & Lee, C. M. (2014). Between black and white: Examining grey literature in meta-analyses of psychological research. *Journal of Child and Family Studies*, 23, 1378-88.
- Bernal, M., Haro, J. M., Bernert, S., Brugha, T., de Graaf, R., Bruffaerts, R., Lépine, J., de Girolamo, G., Vilagut, G., & Gasquet, I. (2007). Risk factors for suicidality in Europe: results from the ESEMED study. *Journal of Affective Disorders*, 101, 27-34.
- Bernert, R. A., Iwata, N., Kim, J., Moscovitz, A., & Horn, M. (2015). Perceived stigma toward mental health in association with sleep disturbances and as an acute predictor of suicidal symptoms. *Sleep*, 38, A340.

- Bernert, R. A., & Joiner, T. B. (2007). Sleep disturbances and suicide risk: A review of the literature. *Neuropsychiatric Disease and Treatment*, 3, 735-43.
- Bernert, R. A., Kim, J. S., Iwata, N. G., & Perlis, M. L. (2015). Sleep Disturbances as an Evidence-Based Suicide Risk Factor. *Current Psychiatry Reports*, 17, 1-9.
- Bernert, R. A., & Nadorff, M. R. (2015). Sleep disturbances and suicide risk. *Sleep Medicine Clinics*, 10, 35-39.
- Borges, G., Nock, M. K., Abad, J. M. H., Hwang, I., Sampson, N. A., Alonso, J., Andrade, L. H., Angermeyer, M. C., Beautrais, A., & Bromet, E. (2010). Twelve-month prevalence of and risk factors for suicide attempts in the World Health Organization World Mental Health Surveys. *The Journal of Clinical Psychiatry*, 71, 1617-28.
- Bozzay, M. L., Karver, M. S., & Verona, E. (2016). Linking insomnia and suicide ideation in college females: The role of socio-cognitive variables and depressive symptoms in suicide risk. *Journal of Affective Disorders*, 199, 106-13.
- Brent, D., Melhem, N., Donohoe, M. B., & Walker, M. (2009). The incidence and course of depression in bereaved youth 21 months after the loss of a parent to suicide, accident, or sudden natural death. *American Journal of Psychiatry*, 166, 786-94.
- Bryan, C. J., Gonzales, J., Rudd, M. D., Bryan, A. O., Clemans, T. A., Ray-Sannerud, B., Wertenberger, E., Leeson, B., Heron, E. A., Morrow, C. E., & Etienne, N. (2015). Depression mediates the relation of insomnia severity with suicide risk in three clinical samples of U.S. military personnel. *Depression and Anxiety*, 32, 647-55.
- Campanario, J. M. (1998). Peer review for journals as it stands today—Part 1. *Science Communication*, 19, 181-211.
- Centers for Disease Control and Prevention (2014). Web-based Injury Statistics Query and Reporting System (WISQARS) Retrieved 9th August 2016, from <http://www.cdc.gov/injury/wisqars/index.html>
- Chu, C., Hom, M. A., Rogers, M. L., Ringer, F. B., Hames, J. L., Suh, S., & Joiner, T. E. (2016). Is insomnia lonely? Exploring thwarted belongingness as an explanatory link between insomnia and suicidal ideation in a sample of South Korean university students. *Journal of Clinical Sleep Medicine*, 12, 647-52.
- Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., & Petticrew, M. (2008). Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ*, 337.
- Dhingra, K., Boduszek, D., & O'Connor, R. C. (2016). A structural test of the Integrated Motivational-Volitional model of suicidal behaviour. *Psychiatry Research*, 239, 169-78.
- Ferraz, L., Portella, M. J., Vázquez, M., Gutiérrez, F., Martín-Blanco, A., Martín-Santos, R., & Subirà, S. (2013). Hostility and childhood sexual abuse as predictors of suicidal behaviour in Borderline Personality Disorder. *Psychiatry Research*, 210, 980-85.
- Gilbert, P., & Allan, S. (1998). The role of defeat and entrapment (arrested flight) in depression: an exploration of an evolutionary view. *Psychological Medicine*, 28, 585-98.
- Golding, S., Nadorff, M. R., Winer, E. S., & Ward, K. C. (2015). Unpacking sleep and suicide in older adults in a combined online sample. *Journal of Clinical Sleep Medicine*, 11, 1385-92.
- Gooding, P., Tarrier, N., Dunn, G., Shaw, J., Awenat, Y., Ulph, F., & Pratt, D. (2015). The moderating effects of coping and self-esteem on the relationship between defeat, entrapment and suicidality in a sample of prisoners at high risk of suicide. *European Psychiatry*, 30, 988-94.
- Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85, 348.
- Gvion, Y., & Apter, A. (2011). Aggression, impulsivity, and suicide behavior: a review of the literature. *Archives of Suicide Research*, 15, 93-112.

- Hales, S. A., Deeproose, C., Goodwin, G. M., & Holmes, E. A. (2011). Cognitions in bipolar affective disorder and unipolar depression: imagining suicide. *Bipolar disorders*, 13, 651-661.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *The British Journal of Psychiatry*, 170, 205-28.
- Harvey, A. G. (2008). Insomnia, psychiatric disorders, and the transdiagnostic perspective. *Current Directions in Psychological Science*, 17, 299-303.
- Harvey, A. G., Murray, G., Chandler, R. A., & Soehner, A. (2011). Sleep disturbance as transdiagnostic: consideration of neurobiological mechanisms. *Clinical Psychology Review*, 31, 225-35.
- Hawton, K., Casañas i Comabella, C., Haw, C., & Saunders, K. (2013). Risk factors for suicide in individuals with depression: a systematic review. *Journal of Affective Disorders*, 147, 17-28.
- Henry, D., Rosenthal, L., Dedrick, D., & Taylor, D. (2013). Understanding patient responses to insomnia. *Behavioral Sleep Medicine*, 11, 40-55.
- Herzog, R., Álvarez-Pasquin, M. J., Díaz, C., Del Barrio, J. L., Estrada, J. M., & Gil, Á. (2013). Are healthcare workers' intentions to vaccinate related to their knowledge, beliefs and attitudes? A systematic review. *BMC Public Health*, 13, 1.
- Hochard, K. D., Heym, N., & Townsend, E. (2016). Investigating the Interaction Between Sleep Symptoms of Arousal and Acquired Capability in Predicting Suicidality. *Suicide and Life-Threatening Behavior*.
- Jeon, H. J., Peng, D., Chua, H. C., Srisurapanont, M., Fava, M., Bae, J.-N., Chang, S. M., & Hong, J. P. (2013). Melancholic features and hostility are associated with suicidality risk in Asian patients with major depressive disorder. *Journal of Affective Disorders*, 148, 368-74.
- Johnson, J., Gooding, P., & Tarrier, N. (2008). Suicide risk in schizophrenia: explanatory models and clinical implications, The Schematic Appraisal Model of Suicide (SAMS). *Psychology and Psychotherapy: Theory, Research and Practice*, 81, 55-77.
- Joiner, T. (2005). *Why People Die by Suicide*. Cambridge, MA, US: Harvard University Press.
- Kamphuis, J., Meerlo, P., Koolhaas, J. M., & Lancel, M. (2012). Poor sleep as a potential causal factor in aggression and violence. *Sleep Medicine*, 13, 327-34.
- Keshavan, M. S., Reynolds, C. F., Montrose, D., Miewald, J., Downs, C., & Sabo, E. M. (1994). Sleep and suicidality in psychotic patients. *Acta Psychiatrica Scandinavica*, 89, 122-5.
- Kerkhof, A. J. F. M., & van Spijker, B. V. (2011). Worrying and rumination as proximal risk factors for suicidal behaviour. In R. O'Connor, S. Platt, & J. Gordon (Eds.), *International handbook of suicide prevention: Research, policy and practice* (pp. 199-209). West Sussex, UK: Wiley-Blackwell.
- Kyle, S. D., Espie, C. A., & Morgan, K. (2010). "...Not just a minor thing, it is something major, which stops you from functioning daily": quality of life and daytime functioning in insomnia. *Behavioral Sleep Medicine*, 8, 123-40.
- Lee, J.-I., Lee, M.-B., Liao, S.-C., Chang, C.-M., Sung, S.-C., Chiang, H.-C., & Tai, C.-W. (2010). Prevalence of suicidal ideation and associated risk factors in the general population. *Journal of the Formosan Medical Association*, 109, 138-47.
- Linehan, M. (1981). Suicidal behaviors questionnaire. *Unpublished inventory, University of Washington, Seattle, Washington*.
- Linehan, M., & Comtois, K. (1996). Lifetime Parasuicide History. University of Washington, Seattle, WA. *Unpublished work*.
- Littlewood, D. L., Gooding, P., Kyle, S. D., Pratt, D., & Peters, S. (2016). Understanding the role of sleep in suicide risk: qualitative interview study. *BMJ Open*.

- Littlewood, D. L., Gooding, P. A., Panagioti, M., & Kyle, S. D. (2016). Nightmares and Suicide in Posttraumatic Stress Disorder: The Mediating Role of Defeat, Entrapment, and Hopelessness. *Journal of Clinical Sleep Medicine*, 12, 393-9.
- Liu, X., & Buysse, D. J. (2006). Sleep and youth suicidal behavior: a neglected field. *Current Opinion in Psychiatry*, 19, 288-93.
- Malik, S., Kanwar, A., Sim, L. A., Prokop, L. J., Wang, Z., Benkhadra, K., & Murad, M. H. (2014). The association between sleep disturbances and suicidal behaviors in patients with psychiatric diagnoses: a systematic review and meta-analysis. *Systems Review*, 3.
- Mauss, I. B., Troy, A. S., & LeBourgeois, M. K. (2013). Poorer sleep quality is associated with lower emotion-regulation ability in a laboratory paradigm. *Cognition & Emotion*, 27, 567-76.
- McCall, W. V., Batson, N., Webster, M., Case, L. D., Joshi, I., Derreberry, T., McDonough, A., & Farris, S. R. (2013). Nightmares and dysfunctional beliefs about sleep mediate the effect of insomnia symptoms on suicidal ideation. *Journal of Clinical Sleep Medicine*, 9, 135-40.
- McCall, W. V., & Black, C. G. (2013). The link between suicide and insomnia: theoretical mechanisms. *Current Psychiatry Reports*, 15, 389.
- Metalsky, G. I., & Joiner Jr, T. E. (1997). The hopelessness depression symptom questionnaire. *Cognitive Therapy and Research*, 21, 359-84.
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of Internal Medicine*, 151, 264-69.
- Morin, C. M., Vallières, A., & Ivers, H. (2007). Dysfunctional beliefs and attitudes about sleep (DBAS): validation of a brief version (DBAS-16). *Sleep*, 30, 1547.
- Morrison, R., & O'Connor, R. C. (2008). A systematic review of the relationship between rumination and suicidality. *Suicide and Life-Threatening Behavior*, 38, 523-38.
- Nadorff, M. R., Anestis, M. D., Nazem, S., Harris, H., & Winer, E. (2014). Sleep disorders and the interpersonal-psychological theory of suicide: Independent pathways to suicidality? *Journal of Affective Disorders*, 152, 505-12.
- Nadorff, M. R., Fiske, A., Sperry, J. A., Petts, R., & Gregg, J. J. (2013). Insomnia symptoms, nightmares, and suicidal ideation in older adults. *Journals of Gerontology Series B-Psychological Sciences & Social Sciences*, 68, 145-52.
- Nadorff, M. R., Nazem, S., & Fiske, A. (2013). Insomnia symptoms, nightmares, and suicide risk: duration of sleep disturbance matters. *Suicide and Life-Threatening Behavior*, 43, 139-49.
- Nock, M. K., Borges, G., Bromet, E. J., Alonso, J., Angermeyer, M., Beautrais, A., Bruffaerts, R., Chiu, W. T., De Girolamo, G., & Gluzman, S. (2008). Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *The British Journal of Psychiatry*, 192, 98-105.
- Norra, C., Richter, N., & Juckel, G. (2011). Sleep disturbances and suicidality: A common association to look for in clinical practise and preventive care. *EPMA Journal*, 2, 295-307.
- O'Connor, R. C. (2011). The integrated motivational-volitional model of suicidal behavior. *Crisis*, 32, 295-8.
- O'Connor, R. C., & Nock, M. K. (2014). The psychology of suicidal behaviour. *The Lancet Psychiatry*, 1, 73-85.
- Office for National Statistics (2016). Suicides in the United Kingdom: 2014 registrations. Retrieved 19th July 2016, from <http://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/suicidesintheunitedkingdom/2014registrations>
- Oquendo, M. A., Currier, D., & Mann, J. J. (2006). Prospective studies of suicidal behavior in major depressive and bipolar disorders: what is the evidence for predictive risk factors? *Acta Psychiatrica Scandinavica*, 114, 151-8.

- Osman, A., Bagge, C. L., Gutierrez, P. M., Konick, L. C., Kopper, B. A., & Barrios, F. X. (2001). The Suicidal Behaviors Questionnaire-Revised (SBQ-R): validation with clinical and nonclinical samples. *Assessment*, 8, 443-54.
- Panagioti, M., Gooding, P., Taylor, P. J., & Tarrier, N. (2012). Negative self-appraisals and suicidal behavior among trauma victims experiencing PTSD symptoms: the mediating role of defeat and entrapment. *Depression and Anxiety*, 29, 187-94.
- Panagioti, M., Gooding, P. A., & Tarrier, N. (2015). A prospective study of suicidal ideation in posttraumatic stress disorder: the role of perceptions of defeat and entrapment. *Journal of Clinical Psychology*, 71, 50-61.
- Paykel, E., Myers, J., Lindenthal, J., & Tanner, J. (1974). Suicidal feelings in the general population: a prevalence study. *The British Journal of Psychiatry*, 124, 460-69.
- Pigeon, W. R., & Caine, E. D. (2010). Insomnia and the risk for suicide: does sleep medicine have interventions that can make a difference? *Sleep Medicine*, 11, 816-7.
- Pigeon, W. R., Pincus, M., & Conner, K. (2012). Meta-analysis of sleep disturbance and suicidal thoughts and behaviors. *Journal of Clinical Psychiatry*, 73, e1160-7.
- Pillai, V., Steenburg, L. A., Ciesla, J. A., Roth, T., & Drake, C. L. (2014). A seven day actigraphy-based study of rumination and sleep disturbance among young adults with depressive symptoms. *Journal of psychosomatic research*, 77, 70-75.
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *The Lancet Psychiatry*, 1, 86-94.
- Qin, P., Mortensen, P. B., Agerbo, E., Westergaard-Nielsen, N., & Eriksson, T. (2000). Gender differences in risk factors for suicide in Denmark. *The British Journal of Psychiatry*, 177, 546-50.
- Reynolds, W. M. (1991). Psychometric characteristics of the Adult Suicidal Ideation Questionnaire in college students. *Journal of Personality Assessment*, 56, 289-307.
- Ribeiro, J. D., Pease, J. L., Gutierrez, P. M., Silva, C., Bernert, R. A., Rudd, M. D., & Joiner, T. E., Jr. (2012). Sleep problems outperform depression and hopelessness as cross-sectional and longitudinal predictors of suicidal ideation and behavior in young adults in the military. *Journal of Affective Disorders*, 136, 743-50.
- Ribeiro, J. D., Silva, C., & Joiner, T. E. (2014). Overarousal interacts with a sense of fearlessness about death to predict suicide risk in a sample of clinical outpatients. *Psychiatry Research*, 218, 106-12.
- Ribeiro, J. D., Yen, S., Joiner, T., & Siegler, I. C. (2015). Capability for suicide interacts with states of heightened arousal to predict death by suicide beyond the effects of depression and hopelessness. *Journal of Affective Disorders*, 188, 53-59.
- Roth, T., Jaeger, S., Jin, R., Kalsekar, A., Stang, P. E., & Kessler, R. C. (2006). Sleep problems, comorbid mental disorders, and role functioning in the national comorbidity survey replication. *Biological psychiatry*, 60, 1364-1371.
- Sabo, E., Reynolds, I. C. F., Kupfer, D. J., & Berman, S. (1991). Sleep, depression, and suicide. *Psychiatry Research*, 36, 265-77.
- Séguin, M., Lesage, A., & Kiely, M. C. (1995). Parental bereavement after suicide and accident: a comparative study. *Suicide and Life-Threatening Behavior*, 25, 489-98.
- Siddaway, A. P., Taylor, P. J., Wood, A. M., & Schulz, J. (2015). A meta-analysis of perceptions of defeat and entrapment in depression, anxiety problems, posttraumatic stress disorder, and suicidality. *Journal of Affective Disorders*, 184, 149-59.
- Singareddy, R. K., & Balon, R. (2001). Sleep and suicide in psychiatric patients. *Annals of Clinical Psychiatry*, 13, 93-101.
- Soehner, A. M., Kaplan, K. A., & Harvey, A. G. (2014). Prevalence and clinical correlates of co-occurring insomnia and hypersomnia symptoms in depression. *Journal of Affective Disorders*, 167, 93-97.
- Soto, J. A., Perez, C. R., Kim, Y.-H., Lee, E. A., & Minnick, M. R. (2011). Is expressive suppression always associated with poorer psychological functioning? A cross-

- cultural comparison between European Americans and Hong Kong Chinese. *Emotion*, 11, 1450.
- Steeg, S., Haigh, M., Webb, R. T., Kapur, N., Awenat, Y., Gooding, P., Pratt, D., & Cooper, J. (2016). The exacerbating influence of hopelessness on other known risk factors for repeat self-harm and suicide. *Journal of Affective Disorders*, 190, 522-28.
- Tarrier, N., Gooding, P., Pratt, D., Kelly, J., Maxwell, J., & Awenat, Y. (2013). *Cognitive behavioural prevention of suicide in psychosis: a treatment manual*: Routledge.
- Taylor, P. J., Wood, A. M., Gooding, P., & Tarrier, N. (2010). Appraisals and suicidality: the mediating role of defeat and entrapment. *Archives of Suicide Research*, 14, 236-47.
- ten Have, M., de Graaf, R., Van Dorsselaer, S., Verdurmen, J., van't Land, H., Vollebergh, W., & Beekman, A. (2009). Incidence and course of suicidal ideation and suicide attempts in the general population. *The Canadian Journal of Psychiatry*, 54, 824-33.
- Trockel, M., Karlin, B. E., Taylor, C. B., Brown, G. K., & Manber, R. (2015). Effects of cognitive behavioral therapy for insomnia on suicidal ideation in veterans. *Sleep*, 38, 259-65.
- Tsuno, N., Besset, A., & Ritchie, K. (2005). Sleep and depression. *Journal of Clinical Psychiatry*, 66, 1254-69.
- Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner Jr, T. E. (2010). The interpersonal theory of suicide. *Psychological Review*, 117, 575.
- Van Orden, K. A., Witte, T. K., Gordon, K. H., Bender, T. W., & Joiner Jr, T. E. (2008). Suicidal desire and the capability for suicide: tests of the interpersonal-psychological theory of suicidal behavior among adults. *Journal of Consulting and Clinical Psychology*, 76, 72.
- Walsh, D., & Downe, S. (2006). Appraising the quality of qualitative research. *Midwifery*, 22, 108-19.
- Weis, D., Rothenberg, L., Moshe, L., Brent, D. A., & Hamdan, S. (2015). The Effect of Sleep Problems on Suicidal Risk among Young Adults in the Presence of Depressive Symptoms and Cognitive Processes. *Archives of Suicide Research*, 19, 321-34.
- Williams, J. M. G., Crane, C., Barnhofer, T., & Duggan, D. S. (2005). Psychology and suicidal behaviour: elaborating the entrapment model. In K. Hawton (Ed.), *Prevention and Treatment of Suicidal Behaviour: From science to practice* (pp. 71-89). Oxford, UK: Oxford University Press.
- Williams, J. M. G., & Williams, M. (1997). *Cry of Pain: Understanding Suicide and Self-harm*: Penguin Books.
- Willoughby, T., Heffer, T., & Hamza, C. A. (2015). The link between nonsuicidal self-injury and acquired capability for suicide: A longitudinal study. *Journal of Abnormal Psychology*, 124, 1110.
- Winer, E. S., Cervone, D., Bryant, J., McKinney, C., Liu, R. T., & Nadorff, M. R. (2016). Distinguishing Mediational Models and Analyses in Clinical Psychology: Atemporal Associations Do Not Imply Causation. *Journal of Clinical Psychology*.
- Winsler, A., Deutsch, A., Vorona, R. D., Payne, P. A., & Szklo-Coxe, M. (2015). Sleepless in Fairfax: the difference one more hour of sleep can make for teen hopelessness, suicidal ideation, and substance use. *Journal of Youth and Adolescence*, 44, 362-78.
- Winsper, C., & Tang, N. K. (2014). Linkages between insomnia and suicidality: prospective associations, high-risk subgroups and possible psychological mechanisms. *International Review of Psychiatry*, 26, 189-204.

- Woosley, J. A., Lichstein, K. L., Taylor, D. J., Riedel, B. W., & Bush, A. J. (2014). Hopelessness mediates the relation between insomnia and suicidal ideation. *Journal of Clinical Sleep Medicine*, 10, 1223-30.
- World Health Organisation (2014). Preventing suicide: A global imperative. Retrieved 29th June 2016, from. http://www.who.int/mental_health/suicide-prevention/world_report_2014/en/
- Woznica, A. A., Carney, C. E., Kuo, J. R., & Moss, T. G. (2015). The insomnia and suicide link: Toward an enhanced understanding of this relationship. *Sleep Medicine Reviews*, 22, 37-46.
- Wu, J. Q., Appleman, E. R., Salazar, R. D., & Ong, J. C. (2015). Cognitive Behavioral Therapy for Insomnia Comorbid With Psychiatric and Medical Conditions: A Meta-analysis. *JAMA Internal Medicine*, 175, 1461-72.
- Zhang, P., Roberts, R. E., Liu, Z., Meng, X., Tang, J., Sun, L., & Yu, Y. (2012). Hostility, physical aggression and trait anger as predictors for suicidal behavior in Chinese adolescents: a school-based study. *PLoS ONE*, 7, e31044.
- Zschoche, M., & Schlarb, A. A. (2015). Is there an association between insomnia symptoms, aggressive behavior, and suicidality in adolescents? *Adolescent Health, Medicine and Therapeutics*, 6, 29-36.

CHAPTER 4.

4. Understanding the role of sleep in suicide risk: qualitative interview study

This paper has been published in BMJ Open.

Littlewood, D. L., Gooding, P., Kyle, S. D., Pratt, D., & Peters, S. (2016). Understanding the role of sleep in suicide risk: qualitative interview study. *BMJ open*, 6(8), e012113.

4.1. Abstract

Objective: Sleep problems are associated with increased risk of suicide, independent of depression. This analysis explores narrative accounts of the role of sleep in relation to suicidal thoughts and behaviours.

Design: Qualitative study, based on in-depth semi-structured interviews which were analysed with an inductive, latent thematic analysis.

Participants: A maximum variation sample of 18 people with experience of a major depressive episode, and suicidal thoughts and behaviours.

Setting: Primary Care, North-West England

Results: Respondents emphasised the importance of sleep for recovery and management of their mental wellbeing. Moreover, three interrelated pathways were identified whereby beliefs about sleep contributed to suicidal thoughts and behaviours. First, being awake during the biological night heightened risk of suicidal behaviours, as this was perceived to be an opportune time for a suicide attempt due to the decreased chances that a friend or family member would intervene during a suicide attempt. Additionally, the reduction in available support at night added to suicide risk. Second, failure to achieve good sleep was perceived to make life harder through contributing to core features of depression, such as negative thinking, attention difficulties and inactivity. Third, sleep acted as an alternative to suicide, by providing an escape from problems, including mental health problems, in waking life. However, this desire to sleep to escape was associated with excessive day-time sleeping, which subsequently may reinforce disturbed sleeping patterns.

Conclusions: Sleep problems should be an important treatment target when working with suicidal clients. More broadly, night-time service provision should be considered when developing suicide prevention initiatives.

4.2. Introduction

Suicide is a prominent cause of preventable death, accounting for approximately 800,000 deaths each year.¹ Recent research highlights that individuals who experience

sleep problems are at an elevated risk of suicidal thoughts and behaviours.²⁻⁶ This is particularly noteworthy given the high prevalence of sleep problems in healthy and clinical populations.^{7,8} Specifically, it is estimated that up to 90% of people with depressive disorders experience sleep problems.⁹ Therefore, it is important to examine the putative mechanisms underlying the relationship between sleep problems and suicidality, which, thus far, have received only limited attention. It is plausible that depressed symptoms are a key driver in the sleep-suicide relationship, but a recent meta-analysis indicated that sleep problems are associated with suicidal thoughts and behaviours, independent of depression.² However, it is noteworthy that more recent evidence investigating the association between insomnia and suicidality has produced mixed results.¹⁰⁻¹² The linkage between nightmares and suicide appears somewhat clearer, with consistent reports of a direct relationship between nightmares and suicidal thoughts and behaviours, independent of psychopathology and comorbid insomnia.^{11, 13, 14} Nightmares have also been shown to mediate the relationship between insomnia and suicidal ideation.¹⁵ This suggests that there may be specific differences in the mechanisms which account for the nightmares/suicide relationship, in comparison to the insomnia/suicide relationship. However, it also remains possible that core mechanisms underpin more generic features of sleep problems, such as sleep discontinuity, altered sleep architecture and poor sleep quality. For instance, a large longitudinal case-control cohort study found that poor sleep quality predicted an increased risk of suicide, across a 10-year period.¹⁶ In addition, recent research has indicated that a state of hyperarousal, which may be common to both insomnia and nightmares, interacted with a person's sense of fearlessness about death to predict suicidal risk.¹⁷

In order to advance understanding of the relationship between sleep problems and suicide, further examination of interrelated psychological processes is warranted.⁴⁻⁶ Indeed, suicidal thoughts and behaviours are hypothesised to develop from interactions between psychological processes and socio-demographic factors.^{18, 19} Therefore,

identifying the specific psychological processes which underpin the sleep-suicide relationship is important to the development of interventions targeted at reducing suicidal thoughts and behaviours.^{18, 20}

Although research in this area is in its infancy, preliminary studies suggest that cognitive-emotional appraisals,^{14, 15, 21} and coping and emotional regulation strategies,²² may partially mediate the relationship between sleep problems and suicidal thoughts and behaviours. However, findings in this area have relied solely on cross-sectional questionnaire designs, which are unlikely to capture the complexity and variance associated with both the experience of sleep problems, and the pathways underlying suicidal thoughts and behaviours. In addition, work to date has examined mechanisms that were hypothesised *a priori* and hence, fail to allow for the identification of novel or additional underlying mechanisms and processes. Therefore, we conducted the first qualitative study in this area, with a view to investigating the perceptions of the role of sleep problems in suicidal pathways, and to identify the core processes which underpin this relationship. Due to the interrelations between sleep problems, suicidality, and depression,^{2, 9, 23} this research was conducted with individuals who had experienced a major depressive episode(s).

4.3. Methods

4.3.1. Study sample.

To be included in the study, all participants had to have experienced a major depressive episode as specified by the Diagnostic and Statistical Manual of Mental Disorders IV; had self-reported suicidal thoughts, feelings and/or behaviours within the past year; were aged 18 to 65 years; and were fluent in English. The Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders IV²⁴ was administered by the first author to confirm past or current experience of a major

depressive episode(s). Ethical approval for this study was granted by the local National Health Service research ethics committee (reference: 15/NW/0147).

A maximum variation approach²⁵ to sampling was taken to gain perspectives from participants with experiences of different sleeping problems (e.g., delayed sleep onset, nightmares). Recruitment was conducted across North West England, UK, and promoted via a number of National Health Service Trust services and mental health charities. In addition, the study was advertised through websites and social media, such as, Gumtree™, Twitter™ and Facebook™.

4.3.2. Procedure.

Semi-structured interviews followed a topic guide which was developed in consultation with a service-user reference group, the members of which had experience of depression and suicidality. Questions largely focused on three domains: i) sleep experiences at different times, i.e., in general, when feeling well, during period(s) of depression, and during times of suicidal thoughts and behaviours; ii) the perceived importance of sleep; iii) the consequences of ‘good’ and ‘bad’ sleep.

Interviews were conducted face-to-face by the first author (DL) at the participants’ preferred location of a private room at the University of Manchester, or at a local medical or community centre. All participants were given the opportunity to ask questions prior to signing the consent form. Interviews were audio-recorded and then transcribed verbatim by the first author and any identifying information (e.g., names and places) was removed at this stage.

A series of questionnaires were administered post-interview to aid characterisation of the sample. Specifically, data were collected about sleep parameters (sleep disorders and quality), suicidal thoughts and behaviours, and interrelated psychological wellbeing factors, such as, depression, anxiety, and alcohol intake (see Table 4.1).

4.3.3. Analysis.

An inductive and latent thematic analysis was used to analyse the data.²⁶ A cyclical approach was taken to data analysis and subsequent data collection, whereby each interview was initially coded prior to subsequent data generation. This allowed tentative codes and themes to be explored and developed further, as interviews progressed. Data analysis was guided by the process described by Braun and Clarke.²⁶ First, data familiarisation was achieved by repeatedly reading the transcripts. Second, transcripts were coded, by conducting a cyclical process, coding both forwards through transcripts, and as new codes emerged returning back to earlier transcripts and re-coding. All authors conducted initial coding independently for the first three interview transcripts. These initial codes were then discussed and compared within the research team, which captured the perspectives influenced by the different backgrounds of this multi-disciplinary team. This triangulation of viewpoints improved the trustworthiness of the data.²⁷ Third, initial themes were generated by grouping the identified codes based on their similarities and differences. Fourth, the themes were reviewed against the data extracted through the coding process. Instances where the data appeared to contradict the initial analysis were highlighted and subsequently discussed by members of the team to establish whether refinement of the wider analysis was necessary.^{28, 29} When new data failed to give further insight into the evolving themes, this was considered to signify thematic saturation and recruitment ceased.

4.4. Results

4.4.1. Participant characteristics.

Means and ranges for clinical characteristics of the sample are provided in Table 4.1.

Table 4.1. *Means and ranges of participant clinical characteristics.*

Questionnaire	Score interpretation guidance	Mean, Range
Beck Scale for Suicide Ideation ³⁰	Higher scores indicate greater levels of suicidal ideation, possible score range 0 – 38.	8.5, 0 - 24
Sleep Condition Indicator ³¹	≤16 indicates possible Insomnia Disorder, as per Diagnostic and Statistical Manual of Mental Disorders V diagnostic criteria, possible score range 0 – 32.	13.8, 4 - 32
The Pittsburgh Sleep Quality Index ³²	>5 indicates poor sleep quality, maximum score = 21.	9.9, 1 – 17.5
Alcohol Use Disorders Identification Test-10 ³³	>7 indicates possible hazardous and harmful alcohol use, maximum score = 40.	6.8, 0 – 39
Beck Depression Inventory-II ³⁴	Higher scores indicate greater severity of depression, possible score range 0 – 63.	23.0, 0 – 51
State-Trait Anxiety Inventory-Trait portion ³⁵	Higher scores indicate greater levels of anxiety, possible score range 20 – 80.	55.3, 34-75
Brief Sleep Screen ³⁶	Assessment of symptoms present in other sleep disorders, such as, narcolepsy, sleep breathing disorder, periodic limb movement in sleep/ restless leg syndrome, circadian rhythm sleep disorder and parasomnia.	N/A

Although all had experienced suicidal thoughts or behaviours in the past year, 12 participants (67%) had previously made one or more suicide attempts. Most participants ($n = 16$; 89%) had experienced multiple major depressive episodes during their lifetime, and ten participants were experiencing a current major depressive episode. At the time of the interviews, 13 participants reported current symptoms consistent with the threshold criteria for Diagnostic and Statistical Manual of Mental Disorders V Insomnia Disorder, as indicated by the Sleep Condition Indicator.³¹ Of these 13, three met quantitative criteria for sleep onset insomnia (SCI items 1) and nine met quantitative criteria for both sleep onset and maintenance insomnia (SCI items 1 and 2). Furthermore, current sleep quality for the majority of the sample was poor, based on scores from the Pittsburgh Sleep Quality Inventory³² ($n = 15$; 83%). In addition, eight participants reported difficulty sleeping due

to bad dreams at least once per week in the month prior to interview. Sociodemographic information about the participants is presented in Table 4.2.

Table 4.2. *Overview of participant socio-demographic characteristics*

Characteristic, <i>n</i> = 18	
Gender, <i>n</i>	
Male	10
Female	8
Age, years	
Mean	33
Range, years	20 - 60
Relationship status, <i>n</i>	
Single	12
Divorced/separated	3
Married/cohabiting	3
Ethnicity, <i>n</i>	
White British	16
Mixed	1
Chinese	1
Employment status, <i>n</i>	
Full-time	3
Part-time	7
Volunteering	3
Unemployed	3
Sick/Disability	2

4.4.2. Thematic analysis of beliefs about the sleep-suicide relationship.

Participants placed high importance on sleep, reporting that poor sleep had detrimental consequences on their waking lives. For some, problematic sleep directly contributed to previous suicide attempts.

“..what’s no coincidence that the times that I did jump off, or cut myself, or run in front of cars or went to the train station, one of the massive reasons of that was that I hadn’t been sleeping. Just total lack of sleep. Majorly. It fucks you up.” (ID1, male)

Generally, participants described more indirect and complex interrelationships between sleep and suicidal thoughts and behaviours. Three distinct, but interrelated pathways were identified whereby a belief about sleep contributed to suicidal thoughts and

behaviours. These pathways were: being awake during the biological night; failure to achieve ‘good’ sleep makes life harder; sleep provides an escape from waking life. An overview of a conceptual model depicting these three pathways is provided in Figure 4.1.

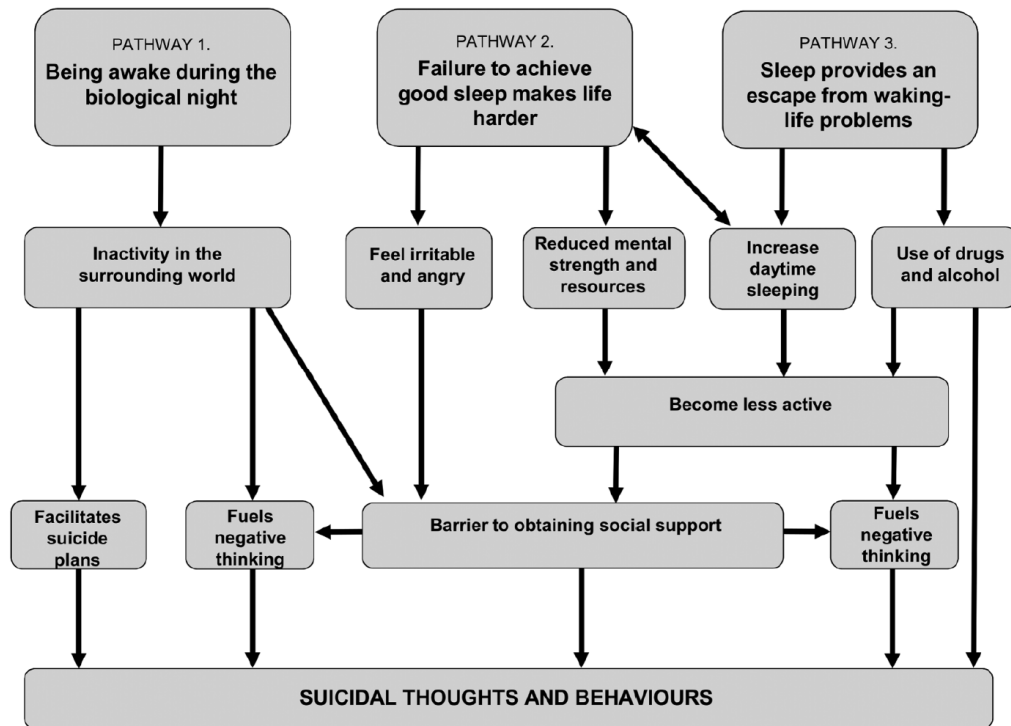


Figure 4.1. Conceptual model of beliefs about sleep and suicidal thoughts and behaviours.

4.4.2.1. Being awake during the biological night.

For participants who experienced difficulty in getting to sleep or in maintaining sleep, being awake during the biological night was associated with greater vulnerability for suicidal thoughts and behaviours. Central to this was the perception of inactivity in the surrounding world. When participants were awake in the night they noticed that the world around them was quiet and sleeping, with no visible signs of activity. Consequently, participants found it harder to effectively re-direct themselves from their negative thoughts. In this sense, night-time acted as a barrier to obtaining social support and to engaging in distracting activities, such as, going for a walk. Without support or distractions, participants described how they were more likely to dwell on negative thoughts.

“I just think because it’s quiet. It’s dark. Lonely. [5 second pause] it’s just, different. I’ve always thought I wished it was light all the time, I wished we didn’t need sleep, I wished the world carried on going 24/7, I wished it didn’t stop at night you know because when the world stops, my heads still going and my worlds still going and, there’s nobody there you know and you can’t ring your mates up in the night and say you know I feel, I feel depressed.” (ID8, female)

As a consequence of the inactivity in the surrounding world, participants reported increased feelings of isolation, which in turn perpetuated negative thinking.

“It had something to do with feeling that everyone was gone at night. [Suicide] Just felt easier to do, I don’t know. When I was generally feeling low, it’s something I’d think about more. Guess the whole, like, there’s no one here, no one cares, would come in to it and that would encourage it.” (ID13, male)

Perceiving inactivity in their immediate world made the night an opportune time for a suicide attempt for some individuals. Participants explained that because other people were asleep, this would prevent them from intervening if they attempted suicide. Therefore, night-time could facilitate suicide plans and hide the consequences of the suicidal behaviours.

“I think if I’m having those feelings [suicidal] it can be any time of the day or night it’s just there’s a slight increase of possibility at night because as I said before about, you could just take the pills and go to sleep, although I’m not going to 'cos it doesn’t work but, there is that slight possibility that at night you have the opportunity, whereas you could do that in the day even if you took

the pills in the day you can't fall asleep or someone will find you or something, whereas they wouldn't find you at night, so suppose there's slightly more opportunity at night." (ID15, male)

4.4.2.2. Failure to achieve good sleep makes life harder.

Participants had a strong desire to sleep well, driven by the belief that there were 'good' types of sleep that could provide the mental and physical resources needed to cope with everyday life. 'Good' sleep was described as long-lasting, uninterrupted, deep, and coupled with a sense of feeling refreshed or energised on waking. However, in general, participants felt they were failing to achieve 'good' sleep. Instead they reported dissatisfaction with their sleep, feeling they slept too little at night, or too much during the day-time, or experienced nightmares, or felt groggy as a consequence of medicated sleep. This failure to achieve 'good' kinds of sleep made life harder in numerous ways. First, failing to sleep well at night was associated with increased feelings of frustration, irritability, and anger. Participants reported that they struggled to contain their anger, snapping at others and making aggressive outbursts. Consequently, these feelings and associated emotional exchanges acted as a barrier to obtaining social support.

"cos when I've had like insomnia where I've like, not slept at all, like literally not slept all night, and I've been up all night long, and the next day, I'm all right for a period of time but then like in the afternoon it just hits me, and I just feel grumpy, moody, don't talk to me I'm tired, and I'll snap at people and I just think I'm so tired and then like in the evening, I feel like when I speak to anybody I'm just no company because I'm just so tired." (ID8, female)

In this sense, sleep problems or anything else which compromised access to social support was seen as problematic, given that participants felt that the absence

of understanding and supportive relationships increased risk of suicidal thoughts and behaviours.

“..so in both, all three times its happened [has felt suicidal] is because someone or some people in my life decided not to be there any more if you get me, left me, threw me away, cast me aside, so that’s what leads to the suicidal thing, as well as all the other stuff you know like with the natural depression or with the nightmares or whatever it is” (ID18, male)

Second, a further perceived consequence of not getting enough sleep at night, was a reduction in mental strength and cognitive resources. This made it harder to control thoughts, focus and process information. Subsequently, participants became less active, which then fed into negative thoughts and feelings.

“...It’s really difficult sort of keeping yourself occupied, keep yourself focused and that doesn’t help coupled with the sort of lacking resources mentally, lacking the energy and again all the slump in posture, so yeah it’s very difficult after a poor night’s sleep to stay positive.” (ID4, male)

Third, both sleeping too much or too little was perceived to negatively impact activity levels. Participants who slept a lot during the day had little time for activities. This, then, fuelled negative thoughts about self-worth because the lack of activity was viewed as signifying laziness and a waste of life. Moreover, those who slept too little at night, had reduced energy to partake in any activities. As a result of this, participants were less likely to engage in activities which help to protect against suicidal thoughts, such as socialising with friends. In this sense, some participants perceived excessive day-time sleeping as indirectly contributing to low mood.

“My problem was oversleeping rather than under-sleeping erm. Yeah I think. I don’t know, a balance because if you’re sleeping too much then you’re just sleeping your life away which is what I feel that I’ve done in many ways.” (ID9, female)

“[on why the participant believes sleeping too much is negative] in terms of my overall health and managing my housework and seeing friends and doing all the other things I could be doing instead of spending three odd hours sleeping in an afternoon.” (ID12, female)

4.4.2.3. Sleep provides an escape from waking-life problems.

When participants wanted to escape from problems in their waking-life, going to sleep was perceived to be one way to achieve this. In this sense, sleep provided short-term respite from low mood or negative thoughts. Getting a break from their waking life was fundamental to the ways in which participants coped with their mental wellbeing. Here, sleep stopped the momentum of negative thoughts or prevented a further escalation of low mood.

“....it feels like a blessed release that you’re unconscious for, how many hours and that you’re no longer thinking about your worthlessness and that you don’t want to exist.” (ID11, male)

For some participants sleep was identified as an alternative to suicide, providing an escape, albeit temporary.

“I feel depressed I feel like. You’ll probably think it sounds mad but, when I wanna die and I have the reasons to live if you know what I mean and I have to keep living for the purpose of my nanna and for looking after her and everything else what I’m doing. Sleep is the next best thing to being dead. So it’s almost like, being

asleep is like being dead and then when you wake up it's like reality hits you, and you wake up and it's like oh I need to go back to sleep just to get away from it all." (ID8, female)

"and you know it's the closest thing you can get to death without actually dying." (ID17, male)

However, it is possible that the 'escape of sleep' may seem less attractive to those who fear sleep as a consequence of experiencing distressing nightmares. One participant spoke of the conflict between the desire to escape from her thoughts, but the reluctance of going to sleep due to the fear of experiencing more distressing nightmares.

"[on why sleep is important to her] it takes me away from my thoughts, but I get a lot of nightmares so sometimes I don't wanna sleep like, I have a fear of falling asleep. Like I lie there and I think urgh, especially if I've had a nightmare the night before and its played on my mind all day, then I'll be like I don't want to sleep." (ID8, female)

The impact that sleep had on participants' subsequent waking state differed. Some viewed sleep as having a 'resetting' function, enabling them to return to waking-life with an improved ability to manage their moods and thoughts.

"it's kind of like the anxiety rises all throughout the day, then after a good 8 or 9 hours sleep it goes right back down again, so that through the next day if it goes up its not reaching it- going really high." (ID2, female)

For others, they preferred sleeping to their waking lives, and consequently, dreaded waking up. One participant viewed sleep as a safer environment than being awake, allowing him to experience emotions during dreaming without any repercussions, unlike the reality of the waking world.

“it means I’m not here erm its means I’m kind of err, I’m in control, but I’m still, I can still feel these different emotions, you know, fear, err, ecstasy, you know, kind of everything in between, erm but you’re safe the whole time.” (ID17, male)

Although sleeping was generally viewed as an effective way to escape problems in waking life, sleeping during the day-time was viewed negatively by some participants. This triggered a pathway, in which sleeping during the day was regarded as a barrier to activity. Participants explained that this type of day-time sleeping may contribute to disturbed night-time sleeping patterns. Here, participants described a vicious circle whereby increased day-time sleeping impaired ability to sleep at night.

“[on sleeping in afternoon] I can see that it is something that I’ll be tempted to do but I’ve got to keep it in my mind now that it’s perhaps not going to do me any favours. It’s a short term crutch. It’s not doing me any long term favours.” (ID12, female)

The use of drugs and alcohol was related to both the desire to sleep and to escape problems in participants' waking life. However, perceptions regarding the effects of alcohol and drug use on sleep and mental health varied. For some, the effects were viewed as positive, bringing relaxation, aiding sleep and facilitating their ability to cope and manage their emotions and mental health.

“...I chose me a natural relaxation [cannabis] and pain relief it gives me, and the mental pain relief, people don’t understand but that’s what it gives me and that allows me to sleep and get, and be able to regularly sleep you know.” (ID18, male)

However, others viewed alcohol and drug use negatively, and as contributing to psychological and physical pain, nightmares, and worsening of mood. One

participant commented that drinking alcohol with their medication increased risk of death, although they perceived this to be a potentially advantageous consequence.

“I’ve used it [alcohol] to like help me fall asleep, you know like, oh I’ll drink some wine or drink some vodka and you know it’ll like knock me out or I’ll take it with a sleeping tablet and then I’ve been advised, you shouldn’t be doing that with that medication, you shouldn’t be drinking with your medication it’s dangerous, and you shouldn’t mix and I’m just thinking oh I don’t care cos you know just, I don’t know, you just, stop caring, and I don’t know you just, don’t care as long as you’re sleeping and, if you die it’s a bonus [laughs] that’s the way I was seeing it.” (ID8, female)

Furthermore, some participants explained that the decision to overdose with drugs or/and alcohol was driven by an underlying preference to die in bed, during sleep, because this form of death was associated with a naturally-occurring death. Dying during sleep was also perceived to be a less physically painful method of death than other alternatives.

“I think because my brain accepts if I go to bed and just drifted off and died its more. It’s not going to come out right this but its more right to do it that way.” (ID7, male)

“I suppose it must have been the idea that you’d drift off into sleep, I guess. I’m not one of those persons that could err, I’m not very good with physical pain so I couldn’t slit my wrists in the bath, I couldn’t do that, so the idea of just drifting off to sleep would’ve been quite a welcome thing, yeah.” (ID15, male)

4.5. Discussion

4.5.1. Principal findings.

This study was the first to utilise a qualitative design to explore the role of sleep in relation to suicidal thoughts and behaviours. A conceptual model was developed to illustrate the ways in which sleep problems were perceived to contribute to suicidal thoughts and behaviours via three distinct, but interrelated, pathways. These were: being awake during the biological night; failure to achieve ‘good’ sleep makes life harder; and sleep provides an escape from problems in waking life.

An important finding was that being awake during the night, when biologically “unprepared” for wakefulness, was perceived to increase suicidal thoughts and behaviours. Lack of access to support during the night was central to increased suicidal behaviours in two ways. First, social support was perceived to be reduced, or unavailable, throughout the night. Second, night-time decreased the chance that a friend, or family member, would notice signs of a suicide attempt (e.g., facial pallor, unresponsiveness). Indeed, this is consistent with a large literature which suggests that social isolation, and lack of social support are associated with mental illnesses, and suicidal thoughts and behaviours.³⁷⁻⁴¹ Studies examining temporal patterning of suicide across the 24 hour day consistently indicate that suicides are more frequent during daytime hours.⁴²⁻⁴⁵ However, recent work by Perlis and colleagues, suggests that when adjusting for the proportion of the population awake at different times of the day, then relative risk of suicide is greater during the night.⁴⁶

Disturbed sleep appeared to contribute to the development, and maintenance, of core features of depression, such as, attention difficulties and inactivity, which subsequently perpetuated negative thinking. Additionally, being awake at night provided more time for negative thinking, with reduced opportunities to access social support or distractions. Two specific types of negative thinking dominated participants’ narratives, i) rumination, and ii) negative self-appraisals, both of which were associated with suicidal

thoughts and behaviours, which is in accord with the broader suicide literature.^{20, 47}

Furthermore, this is consistent with findings from a recent cross-sectional questionnaire study in which rumination partially mediated the relationship between sleep problems and suicidal behaviour.²²

Participants in our study indicated that sleep could act as an alternative to suicide, because it provided a temporary escape from problems in waking life. This is the first time in the literature that this function of sleep has been documented. Entrapment reflects the desire to escape coupled with the perception that escape routes are blocked,⁴⁸ which may trigger suicidal thoughts as a means to escape.^{20, 40, 41} Our results show that sleep may be seen as an alternative way to escape perceptions of entrapment. The potential downside to this occurs when people start ‘escaping’ via sleep in the day-time, because this can disrupt night-time sleep. Subsequently, this may reinforce disturbed sleep patterns, which in turn contribute to increased suicidal thoughts and behaviours. Furthermore, data from the current study suggested that nightmares may trigger fear of sleep, which then made the ‘escape of sleep’ seem less attractive. Consequently, without the escape of ‘good sleep,’ perceptions of entrapment, and suicidal thoughts and behaviours may escalate. Indeed, results from a recent cross-sectional study with individuals who had experienced trauma, indicated that the relationship between nightmares and suicidal behaviour operated indirectly via defeat, entrapment and hopelessness.¹⁴ Taken together, these findings lay the groundwork for future studies to investigate the extent to which the role of entrapment in explaining suicidal pathways varies as a function of the specific type of sleep problem experienced.

4.5.2. Limitations.

There are two limitations to this study. First, although it is considered a strength that this conceptual model was developed from a purposive, maximum variation sample, findings should be complemented with empirical investigation to determine the extent to

which these pathways extend to other mental illness, different levels of depression-severity and across different duration and severity of sleep problems.

Second, to minimise problems with recall, the inclusion criteria specified that participants must have had experience of suicidal thoughts or behaviours in the past year.³⁸ For some participants, memories regarding sleep in the more distant past were often more generalised in comparison with recollections of suicidal experiences. Therefore, it is important for future research to focus on the experiences of those individuals currently exhibiting poor sleep and suicidal behaviours.

4.5.3. Future research.

Our conceptual model included four psychological processes which may underpin the relationship between sleep problems and suicidal thoughts and behaviours. These were social isolation, negative self-appraisals, rumination, and entrapment. Six testable predictions can be generated from our conceptual model, which present potentially promising avenues for further investigation. First, sleep disturbances may strengthen relationships between social isolation and suicidal thoughts and acts. Second, insufficient sleep may be associated with increased negative self-appraisals of the ability to cope with emotions and solve problems, which in turn may increase the likelihood of suicidal thoughts and behaviours. Third, sleep problems may compromise the ability to inhibit negative thoughts, which may then increase suicidal thoughts indirectly, via rumination. Fourth, sleep may alleviate suicidal thoughts and behaviours through reducing perceptions of entrapment. Fifth, perceptions of entrapment may trigger excessive daytime sleeping and reinforce disturbed sleeping patterns, which could subsequently increase suicidal thoughts and behaviour via other psychological processes, such as, social isolation, negative self-appraisals, and rumination. Sixth, to what extent does fear of sleep moderate the role of entrapment in the relationship between sleep problems and suicide. Furthermore, whilst the goal of the current study was to investigate core processes across different types of sleep problems, future empirical work is required to determine whether

the proposed conceptual model extends to explain the relationship between suicide and specific types of sleep problems (e.g., nightmares, insomnia, hypersomnia). Finally, whilst outwith the scope of this qualitative study, further research should also consider the possible role of biological mechanisms in understanding the sleep-suicide relationship.⁶ For instance, based on interrelations between suicide, serotonin and sleep regulation it has been suggested that a reduction in sleep may lead to or potentiate underlying serotonergic dysfunction, which in turn may contribute to suicidal thoughts and behaviours via impaired decision making and reduced cognitive control of emotion.⁶

4.5.4. Clinical implications.

There are four key clinical implications of our findings for those working with people experiencing sleep problems and suicidality. First, night-time service provision should be a key consideration within suicide prevention strategies, given that those who are awake in the night are at an increased risk of suicide.⁴⁶ Second, it seems prudent to help patients evaluate and identify sources of support during the night (e.g., the Samaritans in the United Kingdom, Lifeline in Australia, and National Suicide Prevention Lifeline in the United States). Third, the importance of resolving sleep problems in relation to recovery was emphasised, and consequently, interventions targeting poor sleep should be included within treatment plans. Fourth, clinical techniques should be used which redress rumination, especially in the context of lack of distractions during the night.

4.6. References

1. World Health Organisation. *Preventing suicide: A global imperative*. WHO, 2014 http://www.who.int/mental_health/suicide-prevention/world_report_2014/en/
2. Pigeon WR, Pinquart M, Conner K. Meta-analysis of sleep disturbance and suicidal thoughts and behaviors. *J Clin Psychiatry*. 2012; **73**: e1160-7.
3. Bernert RA, Joiner TE. Sleep disturbances and suicide risk: a review of the literature. *Neuropsychiatr Dis Treat*. 2007; **3**: 735.
4. Winsper C, Tang NK. Linkages between insomnia and suicidality: Prospective associations, high-risk subgroups and possible psychological mechanisms. *Int Rev Psychiatry*. 2014; **26**: 189-204.
5. Woznica AA, Carney CE, Kuo JR, Moss TG. The insomnia and suicide link: toward an enhanced understanding of this relationship. *Sleep Med Rev*. 2014; 37-46.
6. McCall WV, Black CG. The link between suicide and insomnia: theoretical mechanisms. *Curr Psychiatry Rep*. 2013; **15**: 389.

7. Roth T, Jaeger S, Jin R, Kalsekar A, Stang PE, Kessler RC. Sleep problems, comorbid mental disorders, and role functioning in the national comorbidity survey replication. *Biol Psychiatry*. 2006; **60**: 1364-71.
8. Sivertsen B, Krokstad S, Overland S, Mykletun A. The epidemiology of insomnia: associations with physical and mental health. The HUNT-2 study. *J Psychosom Res*. 2009; **67**: 109-16.
9. Tsuno N, Besset A, Ritchie K. Sleep and depression. *J Clin Psychiatry*. 2005; **66**: 1254-69.
10. Nadorff MR, Fiske A, Sperry JA, Petts R, Gregg JJ. Insomnia symptoms, nightmares, and suicidal ideation in older adults. *J Gerontol B Psychol Sci Soc Sci*. 2013; **68**: 145-52.
11. Nadorff MR, Nazem S, Fiske A. Insomnia symptoms, nightmares, and suicidal ideation in a college student sample. *Sleep*. 2011; **34**: 93-8.
12. Nadorff MR, Anestis MD, Nazem S, Claire Harris H, Samuel Winer E. Sleep disorders and the interpersonal-psychological theory of suicide: independent pathways to suicidality? *J Affect Disord*. 2014; **152-154**: 505-12.
13. Golding S, Nadorff MR, Winer ES, Ward KC. Unpacking Sleep and Suicide in Older Adults in a Combined Online Sample. *J Clin Sleep Med*. 2015; **11**: 1385-92.
14. Littlewood DL, Gooding PA, Panagioti M, Kyle SD. Nightmares and Suicide in Posttraumatic Stress Disorder: The Mediating Role of Defeat, Entrapment, and Hopelessness. *J Clin Sleep Med*. 2016; **12**: 393-9.
15. McCall WV, Batson N, Webster M, Case LD, Joshi I, Derreberry T, et al. Nightmares and dysfunctional beliefs about sleep mediate the effect of insomnia symptoms on suicidal ideation. *J Clin Sleep Med*. 2013; **9**: 135-40.
16. Bernert RA, Turvey CL, Conwell Y, Joiner TE, Jr. Association of poor subjective sleep quality with risk for death by suicide during a 10-year period: a longitudinal, population-based study of late life. *JAMA Psychiatry*. 2014; **71**: 1129-37.
17. Ribeiro JD, Silva C, Joiner TE. Overarousal interacts with a sense of fearlessness about death to predict suicide risk in a sample of clinical outpatients. *Psychiatry Res*. 2014; **218**: 106-12.
18. O'Connor RC, Nock MK. The psychology of suicidal behaviour. *Lancet Psychiatry*. 2014; **1**: 73-85.
19. Steeg S, Haigh M, Webb RT, Kapur N, Awenat Y, Gooding P, et al. The exacerbating influence of hopelessness on other known risk factors for repeat self-harm and suicide. *J Affect Disord*. 2016; **190**: 522-8.
20. Johnson J, Gooding P, Tarrier N. Suicide risk in schizophrenia: explanatory models and clinical implications, The Schematic Appraisal Model of Suicide (SAMS). *Psychol Psychother*. 2008; **81**: 55-77.
21. Woosley JA, Lichstein KL, Taylor DJ, Riedel BW, Bush AJ. Hopelessness mediates the relation between insomnia and suicidal ideation. *J Clin Sleep Med*. 2014; **10**: 1223-30.
22. Weis D, Rothenberg L, Moshe L, Brent DA, Hamdan S. The Effect of Sleep Problems on Suicidal Risk among Young Adults in the Presence of Depressive Symptoms and Cognitive Processes. *Arch Suicide Res*. 2015; **19**: 321-34.
23. Tarrier N, Gooding P, Pratt D, Kelly J, Maxwell J, Awenat Y. *Cognitive Behavioural Prevention of Suicide in Psychosis: A Treatment Manual*. East Sussex: Routledge, 2013.
24. First MB, Spitzer RL, Gibbon M, Williams JB. *User's guide for the Structured clinical interview for DSM-IV axis I disorders SCID-I: clinician version*. Washington DC: American Psychiatric Pub, 1997.
25. Patton MQ. *Qualitative evaluation and research methods*. California: SAGE Publications, inc, 1990.
26. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006; **3**: 77-101.

27. Peters S. Qualitative research methods in mental health. *Evid Based Ment Health*. 2010; **13**: 35-40.
28. Henwood KL, Pidgeon NF. Qualitative research and psychological theorizing. *Br J Psychol*. 1992; **83**: 97-111.
29. Mays N, Pope C. Qualitative research in health care: Assessing quality in qualitative research. *BMJ*. 2000; **320**: 50.
30. Beck AT, Steer RA, Ranieri WF. Scale for suicide ideation: Psychometric properties of a self-report version. *J Clin Psychol*. 1988; **44**: 499-505.
31. Espie CA, Kyle SD, Hames P, Gardani M, Fleming L, Cape J. The Sleep Condition Indicator: a clinical screening tool to evaluate insomnia disorder. *BMJ Open*. 2014; **4**: e004183.
32. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989; **28**: 193-213.
33. Saunders JB, Aasland OG, Babor TF, De la Fuente JR, Grant M. Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption—II. *Addiction*. 1993; **88**: 791-804.
34. Beck AT, Steer RA, Brown GK. *BDI-II, Beck Depression Inventory: Manual*. San Antonio: Psychological Corporation, 1996.
35. Spielberger CD. *State-Trait anxiety inventory*. Wiley Online Library, 2010.
36. Wilson SJ, Nutt DJ, Alford C, Argyropoulos SV, Baldwin DS, Bateson AN, et al. British Association for Psychopharmacology consensus statement on evidence-based treatment of insomnia, parasomnias and circadian rhythm disorders. *J Psychopharmacol*. 2010; **24**: 1577-601.
37. Bearman PS, Moody J. Suicide and friendships among American adolescents. *Am J Public Health*. 2004; **94**: 89-95.
38. Owen R, Gooding P, Dempsey R, Jones S. A qualitative investigation into the relationships between social factors and suicidal thoughts and acts experienced by people with a bipolar disorder diagnosis. *J Affect Disord*. 2015; **176**: 133-40.
39. Van Orden KA, Witte TK, Cukrowicz KC, Braithwaite SR, Selby EA, Joiner TE, Jr. The interpersonal theory of suicide. *Psychol Rev*. 2010; **117**: 575-600.
40. Williams JMG. *Cry of pain*. Penguin Books, 1997.
41. Williams JMG, Crane C, Barnhofer T, Duggan DS. Psychology and suicidal behaviour: elaborating the entrapment model. In: K Hawton, ed. *Prevention and treatment of suicidal behaviour: From science to practice*. Oxford University Press 2005: 71-89.
42. van Houwelingen CA, Beersma DG. Seasonal changes in 24-h patterns of suicide rates: a study on train suicides in The Netherlands. *J Affect Disord*. 2001; **66**: 215-23.
43. Erazo N, Baumert J, Ladwig KH. Sex-specific time patterns of suicidal acts on the German railway system. An analysis of 4003 cases. *J Affect Disord*. 2004; **83**: 1-9.
44. Altamura C, VanGastel A, Pioli R, Mannu P, Maes M. Seasonal and circadian rhythms in suicide in Cagliari, Italy. *J Affect Disord*. 1999; **53**: 77-85.
45. Preti A, Miotto P. Diurnal variations in suicide by age and gender in Italy. *J Affect Disord*. 2001; **65**: 253-61.
46. Perlis ML, Grandner MA, Chakravorty S, Bernert RA, Brown GK, Thase ME. Suicide and sleep: Is it a bad thing to be awake when reason sleeps? *Sleep Med Rev*. 2015; **29**: 101-7.
47. Morrison R, O'Connor RC. A systematic review of the relationship between rumination and suicidality. *Suicide Life Threat Behav*. 2008; **38**: 523-38.
48. Gilbert P, Allan S. The role of defeat and entrapment (arrested flight) in depression: an exploration of an evolutionary view. *Psychol Med*. 1998; **28**: 585-98.

CHAPTER 5.

5. Nightmares and suicide in posttraumatic stress disorder: the mediating role of defeat, entrapment, and hopelessness.

This paper has been published in Journal of clinical sleep medicine

Littlewood, D. L., Gooding, P. A., Panagioti, M., & Kyle, S. D. (2016). Nightmares and suicide in posttraumatic stress disorder: the mediating role of defeat, entrapment, and hopelessness. *Journal of clinical sleep medicine: JCSM: official publication of the American Academy of Sleep Medicine*, 12(3), 393.

5.1. Abstract

Study objectives: Although nightmares appear to be related to suicidal behaviors, the mechanisms which underpin this relationship are unknown. We sought to address this gap by examining a multiple mediation hypothesis whereby nightmares were predicted to have an indirect effect on suicidal behaviors through perceptions of defeat, entrapment, and hopelessness.

Methods: Data were collected from 91 participants who had experienced trauma and symptoms of posttraumatic stress disorder (PTSD). Nightmares were measured by summing the frequency and intensity ratings of relevant items on the Clinician-Administered PTSD Scale. Participants also completed questionnaire measures of suicidal behavior, hopelessness, defeat, and entrapment. Given the interrelations between insomnia, PTSD, and suicide, a measure of insomnia was included as a covariate. Furthermore, analyses were conducted with and without those participants who had comorbid depression.

Results: Suicidal behaviors were higher in those participants who experienced nightmares (62%), in comparison to those who did not (20%). Bootstrapped analyses provided support for the hypothesized multistep mediational model. Specifically, nightmares were both directly and indirectly associated with suicidal behaviors, through perceptions of defeat, entrapment, and hopelessness, independent of comorbid insomnia and depression.

Conclusions: For the first time we show that the relationship between nightmares and suicidal behaviors is partially mediated by a multistep pathway via defeat, entrapment, and hopelessness. Clinically, our work highlights the importance of monitoring and targeting nightmares and perceptions of defeat, entrapment, and hopelessness when working with clients who have experienced trauma.

5.2. Introduction

Suicide is a major public health concern accounting for approximately 800,000 deaths worldwide each year.¹ In order to develop effective clinical prevention strategies, it is crucial to understand how risk factors and psychological mechanisms interact within suicidal pathways. Sleep problems, have been identified as a modifiable risk factor for suicidal behaviors, such as, suicidal thoughts, plans, and attempts.² While there is a growing body of research reporting robust associations between sleep problems and suicidal behaviors,² such work has not elucidated the psychological mechanisms which underpin this relationship.

One specific type of sleep problem that is associated with suicidal behaviors is the experience of nightmares.³⁻¹¹ A recent meta-analysis based on 14 studies, including both clinical and non-clinical samples, indicated that individuals who experienced nightmares were 2.61 times more likely to experience suicidal behaviors than those who did not experience nightmares.² Moreover, a longitudinal study of people who had previously attempted suicide found that having frequent nightmares at both baseline and two months later, was associated with a greater risk of a subsequent suicide attempt within the following two-year period.⁶ While nightmares have been associated with a range of mental illnesses, they appear to be particularly prevalent in those with posttraumatic stress disorder (PTSD). Estimates indicate that up to 90% of individuals experience nightmares in the acute phase following trauma.¹² Nightmares and sleep disturbance are included within the DSM-V diagnostic criteria for PTSD and are repeatedly referred to as core or hallmark symptoms of PTSD.¹³⁻¹⁵ Furthermore, PTSD substantially increases the risk of suicidal thoughts or behaviors,¹⁶ with one large population-based study indicating that individuals with PTSD were almost three times more likely to experience suicidal thoughts or behaviors than those without PTSD.¹⁷ Surprisingly, despite the interrelationships between nightmares, PTSD, and suicide, no study to date has examined

the psychological mechanisms underpinning the association between nightmares and suicidal behaviors in those experiencing PTSD.

So far, research investigating psychological mechanisms is confined to one study that examined the extent to which the relationship between nightmares and suicide could be explained by Joiner's¹⁸ Interpersonal-Psychological Theory of Suicide (IPTs).⁵ Data from two different samples of college students consistently indicated that nightmares were significantly associated with suicide attempts, independent of depression and constructs identified by the IPTs, namely perceived burdensomeness, thwarted belongingness, and acquired suicide capability. Therefore, it is important to examine the role of explanatory psychological processes, or factors, within the context of the relationship between nightmares and suicide.

Three plausible factors are defeat, entrapment, and hopelessness, which feature across different contemporary psychological models of suicidal behaviors.¹⁹⁻²² Defeat and entrapment stem from an evolutionary model of depression, whereby defeat is purported to refer to a feeling of failed struggle which is associated with a loss of social status.²³ Entrapment is thought to be associated with a desire to escape, especially when there is a perception that escape routes are blocked.²³ Indeed, Baumeister's early work highlighted that suicide may represent an escape from the self.²⁴ When applied to suicide, theoretical accounts provide a broadly similar postulation; that detrimental perceptions of defeat and entrapment drive suicidal behaviors as a means of escaping from extreme negative feelings and distress.¹⁹⁻²¹ This is supported by the extant literature, which has reported associations between defeat and entrapment, and suicidal behaviors in those with PTSD.^{25,26}

Hopelessness is a robust risk factor for suicidal behaviors, representing pessimism for the future.²⁷ The Cry of Pain model theorized a suicidal pathway whereby defeat triggers entrapment, which in turn elicits hopelessness when perceptions of thwarted

escape are projected into the future.^{19,20} Based on the Cry of Pain model, nightmares may be related to suicidal behavior indirectly through defeat, entrapment, and hopelessness. From this perspective, nightmares act as a stressor and directly trigger perceptions of defeat. In lieu of any empirical evidence examining the relationship between defeat and nightmares, it can be posited that nightmares may trigger perceptions of defeat due to their trauma-related content. Within the context of PTSD, nightmares are often based on the initial traumatic event that the individual experienced, and consequently individuals may re-experience the emotions associated with this trauma.²⁸ It is possible that nightmares may reactivate perceptions of defeat, entrapment, and hopelessness. Alternatively, it is possible that negative appraisals of the ability to cope with, or manage, these ongoing nightmares may give rise to defeat.²¹

The current study had two main aims. The first was to investigate whether nightmares were associated with suicidal behaviors. The second aim was to examine possible multistep indirect pathways of the association between nightmares and suicidal behaviors through (i) defeat, (ii) entrapment, and (iii) hopelessness (as depicted in Figure 5.1). Specifically, it was hypothesized that nightmares would be associated with suicidal behavior. Furthermore, this association was hypothesized to operate via an indirect pathway whereby nightmares would lead to defeat, defeat would lead to entrapment, entrapment would lead to hopelessness, and hopelessness would lead to suicidal behavior (as illustrated in bold in Figure 5.1). Finally, it was hypothesized that indirect and direct pathways would pertain, even when controlling for depression and insomnia.

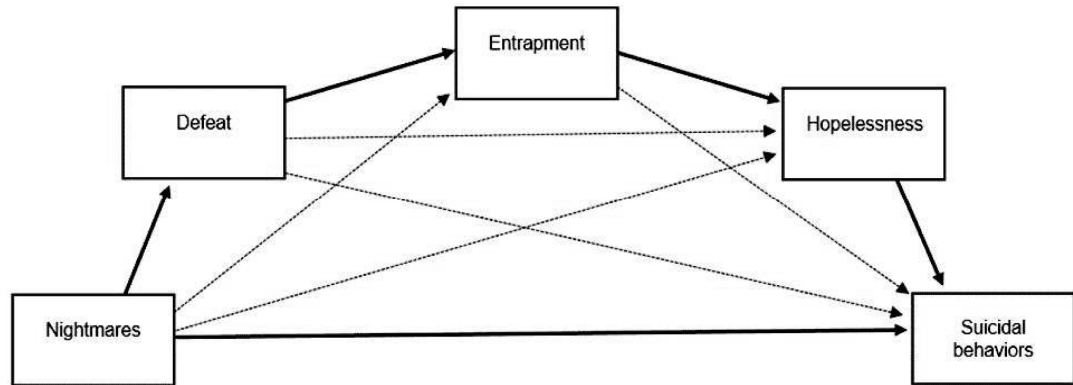


Figure 5.1. Multiple mediation model for nightmares and suicidal behavior, via defeat, entrapment, and hopelessness (controlling for insomnia). Predicted mediational pathway highlighted in bold.

5.3. Methods

5.3.1. Participants.

Data were collected as part of an earlier study examining the associations between suicidal behavior, hopelessness, defeat, and entrapment, in people experiencing PTSD symptoms.²⁵ Inclusion criteria were: (a) have experienced a serious traumatic event in the past and meet criterion A of the Posttraumatic Stress Diagnostic Scale,²⁹ which refers to the severity of a traumatic event and its consequential impact; (b) aged 18-65 years; (c) English-speaking. Participants with dementia, organic brain disorder, or an active psychotic disorder were excluded from the study. Data from 4 participants were excluded because they did not complete the defeat and entrapment scales. The remaining sample of 91 participants ($M_{Age} = 28.87$, $SD = 10.64$), included 66 females (73% $M_{Age} = 28.56$, $SD = 10.75$), 24 males (26% $M_{Age} = 30.08$, $SD = 10.56$), and one participant who did not specify gender. Participants reported a range of PTSD symptoms, with the sample comprised of 50 participants who met criteria for a clinical diagnosis of PTSD.

5.3.2. Measures.

Nightmare severity was measured by summing the 2 recurrent or distressing dreams items within the Clinician-Administered PTSD Scale for DSM-IV (CAPS).³⁰ The first item measured the amount of distress the dreams caused by asking whether the

dreams caused the individual to wake up, on waking what feelings they had, and subsequent problems returning to sleep related to distress caused by the dream. The second item refers to the frequency of nightmares over the past month.

Suicidal behaviors were measured by the 4-item Suicidal Behaviors Questionnaire-Revised (SBQ-R).³¹ This questionnaire assesses lifetime level of suicidal behaviors, level of suicidal thoughts within the past year, communication of suicidal intent to others, and likelihood of a future suicide attempt. Possible total scores range from 3 to 18, with higher scores reflecting more suicidal behaviors. In the current sample, the α coefficient was 0.87.

Defeat was assessed by a 16-item scale,²³ designed to measure the extent to which participants have felt defeated during the previous week (e.g., “I feel that I have not made it in life”). Total scores range from 0 to 64, with higher scores indicating greater levels of defeat. Cronbach α for the current sample was 0.96.

Entrapment was measured with a 16-item scale that assesses feelings of entrapment (e.g., “I would like to get away from other more powerful people in my life”).²³ The total score ranges from 0 to 64, with higher scores indicating greater levels of entrapment. In this current study Cronbach α for the entrapment scale was 0.95.

Hopelessness was measured with the 20-item Beck Hopelessness Scale (BHS) which assesses perceptions of pessimism for the future.³² Participants score each statement true or false to indicate whether the given statement reflects their experiences across the past week (e.g., “I look forward to the future with hope and enthusiasm”). Possible total scores range from 0 to 20, with higher scores indicating greater levels of hopelessness. In the current sample, the α coefficient was 0.89.

Insomnia was measured by summing the 2 difficulty in falling or maintaining sleep items within the CAPS, in accordance with the scoring procedure for the full scale.³⁰ The first item assesses how frequently participants had problems falling or maintaining sleep

within the past month. The second item measures the intensity of the sleep problem, including amount of sleep lost.

Comorbid depression was based on whether participant reported a previous diagnosis of depression. Responses to this question were used to allocate participants to a comorbid depression group within the exploratory analyses.

5.3.3. Procedure.

The CAPS interview was administered first, by the third author (MP), to confirm a clinical diagnosis of PTSD. Participants completed a battery of questionnaire measures in a specified order, namely, defeat, entrapment, hopelessness, and suicidal behavior. On completion of the study, participants were provided with a debriefing sheet including contact information for appropriate support services. Furthermore, participants who met the specified criteria for suicidal risk (i.e., SBQ-R item 1 $\geq$ 3; item 2 $\geq$ 3; item 3 $\geq$ 2; item 4 $\geq$ 4) were referred to their healthcare contact, provided they had earlier given consent for this protocol. Ethics approval for this study was obtained from the relevant NHS research ethics committee.

5.3.4. Analysis strategy.

Prior to testing the hypotheses the normality of the data was assessed by calculating the Z score for skew and kurtosis values, which indicated that the suicidal behavior data were positively skewed, and the nightmare data was negatively skewed. Transformations failed to normalize the data. Therefore, a nonparametric resampling technique, known as bootstrapping was applied in all analyses (correlations, regression, and mediation models) as an appropriate statistical technique.³³ Bootstrapping refers to the repeated re-sampling from the initial dataset to generate the statistic of interest for the additional number of subsamples.³³ In this study, bootstrapped confidence intervals were calculated based on 5000 bootstrap replications.

Descriptive statistics and Pearson product-moment correlational analyses were calculated for all study variables. Hierarchical regression analyses were conducted to test the first hypothesis, that nightmares would be associated with suicidal behaviors, independent of insomnia and depression. The predictor variable, nightmares, and control variable, insomnia, were standardized prior to entry into the hierarchical regression models. Suicidal behaviors was entered as the outcome variable. Insomnia was entered into the first step of the model, followed by nightmares which was entered into the second step.

Serial multiple-mediational analyses were performed given the hypothesized relationships between the 3 mediating variables, whereby perception of defeat was postulated to trigger entrapment, which subsequently may lead to the development of hopelessness. As the model includes 3 mediator variables, there are 8 possible pathways in which nightmares may be associated with suicidal behaviors, 1 direct and 7 indirect (as illustrated in Figure 51). All mediational analyses were conducted using the SPSS macro PROCESS,³⁴ with bias-corrected bootstrap replications to generate 95% confidence intervals. Indirect effects were interpreted as significant when zero was not included within the 95% CIs.³⁴

Effects of comorbid depression were examined by removing the data of participants with a diagnosis of depression ($n = 27$) and then recalculating the hierarchical regression and mediation analyses. Data management and analyses were performed using SPSS 22.0 (2013).

5.4. Results

5.4.1. Sample characteristics.

Although participants were recruited based on their experience of trauma, 51 reported a current diagnosis of PTSD and a further 24 participants stated that they had a past diagnosis of PTSD. Presence of a comorbid mental illness was also reported by 36

participants (depression $n = 27$, bipolar disorder $n = 4$, borderline personality disorder $n = 3$, other $n = 2$). A total of 63% of participants experienced nightmares at least once a week during the past month. A χ^2 test indicated that suicidal thoughts, plans, or attempts were significantly higher among those who experienced nightmares within the past month (62%) than participants without nightmares (20%; $\chi^2(1) = 12.87, p < 0.001$).

5.4.2. Preliminary analyses.

Descriptive statistics and correlational analyses are presented in Table 5.1 for all study variables. Correlation coefficients between all variables were positive and significant.

Table 5.1. Means (with standard deviations in parenthesis), ranges and Pearson product-moment correlational coefficients for nightmares, suicide, defeat, entrapment, hopelessness, and insomnia

	Mean (SD)	Min	Max	2	3	4	5	6
1. Nightmares (CAPS Q)	3.37 (2.36)	0	7	0.48***	0.53***	0.48***	0.48***	0.54***
2. Suicide (SBQR)	5.95 (4.01)	3	18		0.52***	0.55***	0.62***	0.34***
3. Defeat	43.87 (17.03)	3	64			0.82***	0.83***	0.45***
4. Entrapment	41.40 (17.85)	3	64				0.80***	0.45***
5. Hopelessness (BHS)	12.64 (5.92)	0	20					0.44***
6. Insomnia (CAPS Q)	4.14 (2.12)	0	8					

Note: *** $p < 0.001$.

A hierarchical regression model indicated that after controlling for insomnia, nightmares explained an additional 12.8% of the variance in suicidal behaviors ($R^2 = 0.24$, $\Delta R^2 = 0.13$, $F_{change, 88} = 14.91, p < 0.001$). In line with the first prediction, nightmares significantly predicted suicidal behaviors, independent of insomnia ($\beta = 0.43$, $t = 3.86, p < 0.001$, $B = 1.71$ [95% CI = 1.05-2.45]). Participants with a comorbid diagnosis of depression were then removed from the sample, and the regression model was then

recalculated. The pattern of findings remained the same,⁴ indicating a positive association between nightmares and suicidal behaviors ($\beta = 0.38$, $t = 2.93$, $p < 0.01$, $B = 1.22$ [95% CI = 0.50-1.97]).

Table 5.2. *Point estimates for indirect effects and 95% bias-corrected confidence intervals for multiple mediational analysis in which defeat, entrapment, and hopelessness were represented as mediators in the association between nightmares and suicidal behavior (controlling for insomnia)*

Path	Confidence Intervals (95%)		
	Estimate	Lower	Upper
Nightmares>Defeat>Suicidal behaviors	-0.23	-0.95	0.13
Nightmares>Defeat>Entrapment> Suicidal behaviors	0.21	-0.03	0.70
Nightmares>Defeat>Hopelessness>Suicidal behaviors	0.41	0.14	1.04
Nightmares>Defeat>Entrapment>Hopelessness>Suicidal behaviors	0.21	0.05	0.65
Nightmares>Entrapment>Suicidal behaviors	0.02	-0.09	0.20
Nightmares>Entrapment>Hopelessness>Suicidal behaviors	0.02	-0.10	0.16
Nightmares>Hopelessness>Suicidal behaviors	0.05	-0.28	0.36
Total indirect effects	0.68	0.27	1.22

5.4.3. Multiple mediation analyses.

The total effect for the entire model was significant (point estimate =1.71; 95% CI: 0.83-2.58). Direct effect point estimates are presented for the full mediational model in Figure 5.2. Point estimates and bootstrapped 95%CI for the total indirect effect and 7 specific indirect pathways are provided in Table 5.2. The mediational analysis indicated that the total indirect effect and 2 specific indirect effects were significant. First,

⁴After controlling for insomnia, nightmares explained an additional 11.5% of the variance in suicidal behaviors ($R^2 = 0.18$, $\Delta R^2 = 0.12$, $F_{change, 61} = 8.56$, $p < 0.01$).

nightmares were associated with suicidal behaviors indirectly through defeat, to entrapment, to hopelessness. Second, nightmares were associated with suicidal behaviors indirectly through defeat, to hopelessness.

Finally, the mediational analysis was recalculated, after removing participants with a comorbid diagnosis of depression, which produced the same patterns of results.⁵

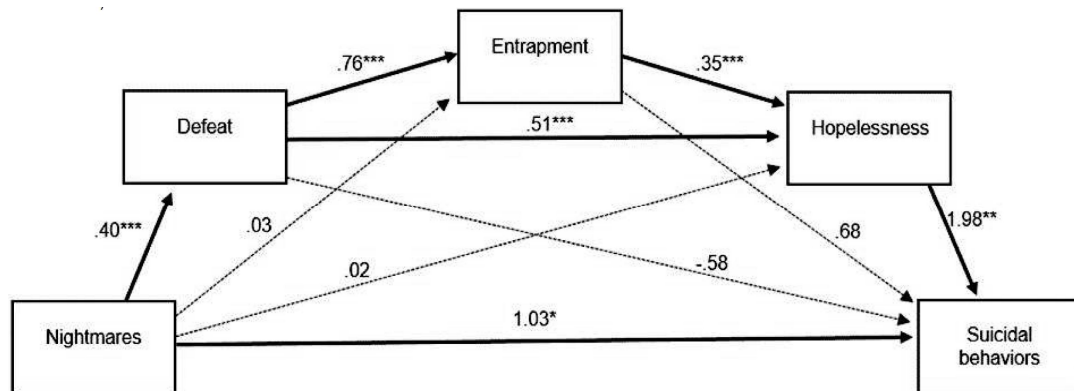


Figure 5.2. Multiple mediation model for nightmares and suicidal behavior, via defeat, entrapment and hopelessness (controlling for insomnia). Significant pathways highlighted in bold.

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

5.5. Discussion

The current study sought to advance the understanding of the association between nightmares and suicidal behaviors in people with symptoms of PTSD, by examining theoretically based mediational pathways.¹⁹⁻²¹ Analyses supported the predicted four-step indirect pathway, whereby nightmares have an indirect effect on suicidal behaviors through perceptions of defeat, entrapment, and hopelessness. Furthermore, this pathway operated independent of comorbid insomnia, and of a comorbid diagnosis of depression.

In line with the first prediction, and corroborating earlier research,^{3,7} nightmares were associated with suicidal behaviors independent of the effects of comorbid insomnia

⁵ Significant effects reported as follows, total effect (point estimate = 1.22; 95% CI: 0.39-2.05), total direct effect between nightmares and suicidal behaviors (point estimate = 0.84; 95% CI: 0.03-1.65), total indirect effect (point estimate = 0.38; 95% CI: 0.06-0.99), indirect effects for nightmares to defeat, to entrapment, to hopelessness to suicidal behavior (point estimate = 0.13; 95% CI: 0.01-0.52), indirect effects for nightmares to defeat, to hopelessness to suicidal behavior (point estimate = 0.14; 95% CI: 0.02-0.61).

and depression. Moreover, suicidal behavior was more frequent among those people who reported experiencing nightmares than in those who did not experience nightmares. These findings further validate the extant literature which suggests that nightmares are a risk factor for suicidal behavior.³⁻¹¹

Results from the mediational analyses indicated that the association between nightmares and suicidal behaviors operated both directly and indirectly via a four-step mediational pathway of (i) defeat, and (ii) entrapment, and (iii) hopelessness, supporting our second prediction. The indirect pathway was based on the hypothesis that nightmares may trigger defeat, which in turn may be associated with entrapment and hopelessness based on perceptions of the inability to escape from defeat.^{19,20} Suicide may then be considered as a possible escape strategy.^{19-21,24} As this is the first study to examine the role of defeat, entrapment and hopelessness in the context of the nightmares/suicide association, replication is important. Furthermore, research should seek to examine the nature of the relationship between nightmares and defeat. It is possible that defeat may emerge from the actual content of the nightmare. This may be particularly relevant in instances where nightmares, based on the memory of the traumatic event, re-activate associated emotions and symptoms.²⁸ For example, where nightmare content is based on an instance of abuse, as a victim the individual may consequently feel that they have been defeated by the perpetrator of the abuse as re-experienced through the nightmare. Alternatively, negative self-appraisals may mediate the relationship between nightmares and defeat, whereby an individual negatively appraises their ability to cope or manage nightmares, which triggers defeat. Indeed, proponents of the Schematic Appraisals Model of Suicidal behavior (SAMS), emphasize the deleterious nature of negative self-related appraisals which give rise to defeat and entrapment.²¹ This suggestion is supported by findings from research investigating rapid eye movement (REM) sleep, the sleep stage where nightmares generally occur.³⁵ Specifically, individuals with depression and anxiety

show a bias towards negative self-appraisals when woken from REM sleep, in comparison with self-appraisals following non-REM sleep awaking.³⁶

It is important to note that within the full mediational model presented in this paper, nightmares maintained a direct association with suicidal behaviors. This finding points towards the likelihood of additional pathways which underpin this relationship. Subsequent research may build on the current study, and that conducted by Nadorff and colleagues,⁵ by integrating the underlying psychological and neurobiological processes to identify candidate mediators suitable for hypotheses testing. In addition to the suggested role of negative cognitive appraisals, the frequent re-experiencing of the traumatic event via nightmares as typified in PTSD, may also hinder emotional and mood regulation as a consequence of disrupted REM sleep.³⁷ Moreover, emotional dysregulation,³⁸ and disturbed REM sleep are both associated with suicidal behaviors.³⁹ Accordingly, research should examine the role of emotional regulation and self-appraisals, within the context of the nightmares/ suicide relationship.

Findings from the current study have two important clinical implications. First, results further corroborate the association between nightmares and increased suicidal risk.^{3-5,7-11} Hence, clinicians should explore the presence and effects of nightmares routinely with individuals who are experiencing symptoms of PTSD. Furthermore, levels of defeat, entrapment and hopelessness should also be monitored in those who report nightmares. Second, it may be insufficient to solely administer interventions for PTSD, given that research indicates that sleep problems may persist post-intervention.⁴⁰ Rather, clinicians may consider incorporating sleep-targeted interventions into treatment provision.⁴¹ For example, there is strong empirical evidence to support the efficacy of Imagery Rehearsal Therapy (IRT) in treating nightmares.⁴¹ IRT alleviates nightmares by asking the patient to recall the nightmare and then rescript it into something less distressing. This new content is then rehearsed with the aid of supporting imagery. Alternatively, prazosin is the leading pharmacological agent advocated for use to treat

PTSD-related nightmares.⁴¹ However, there is currently insufficient evidence to suggest whether these sleep-focused psychological or pharmacological treatments may generate additional positive outcomes in associated levels of suicidal behaviors, defeat, entrapment, and hopelessness.

The current pattern of results should be viewed within the context of four limitations. First, the cross-sectional nature of the data prevents causal interpretations. Future studies should examine the identified mediational pathways using longitudinal designs. Second, the sample size within the current study is relatively small, which may limit the extent to which these findings generalize to more widely to people with symptoms of PTSD. However, bootstrapping was applied as the most appropriate technique for mediation analysis with small sample sizes.³³ Third, details regarding use of psychotropic medication were not collected. This should be routinely included in future studies given that certain types of psychotropic medication may impact sleep architecture and in particular REM sleep. Fourth, as this study is based on an analysis of existing data, measures of nightmares and insomnia were drawn from frequency and intensity items within the CAPS. Therefore, it is appropriate for these findings to be replicated using specific validated measures of nightmares and insomnia. This may also permit a finer analysis of the specific aspects of nightmares, such as frequency versus distress, which are often only weakly correlated.³⁵ Moreover, nightmares within the context of this study were specific to the traumatic event. Therefore, it is possible that findings from this study may not generalize more widely to idiopathic nightmares. In addition, we did not assess for other sleep disorders within our sample, such as sleep disordered breathing or other parasomnias; thus, future work should incorporate more comprehensive sleep measurement in future studies of the sleep-suicide relationship. Finally, depression diagnosis was based on responses to a single question, future studies should account for this limitation with use of validated measures.

5.6. Conclusions

In conclusion, the present study is novel and important in that it is the first to report that the association between nightmares and suicidal behaviors, operates via defeat, entrapment, and hopelessness. However, nightmares maintained a direct effect on suicidal behaviors, independent of the specified indirect pathways. Therefore, it is imperative that future research focuses on identifying additional pathways which account for this association. Furthermore, it is worth noting that both the direct and indirect association between nightmares and suicidal behaviors operated independent of comorbid insomnia and depression. From a therapeutic perspective, clinicians should consider targeting interventions at co-occurring nightmares and suicidal behaviors, while monitoring levels of defeat, entrapment, and hopelessness.

5.7. References

1. World Health Organisation. *Preventing suicide: A global imperative*. World Health Organisation, 2014:92.
2. Pigeon WR, Pinquart M, Conner K. Meta-analysis of sleep disturbance and suicidal thoughts and behaviors. *J Clin Psychiatry* 2012;73:e1160-7.
3. Cukrowicz KC, Otamendi A, Pinto JV, Bernert RA, Krakow B, Joiner TE Jr. The impact of insomnia and sleep disturbances on depression and suicidality. *Dreaming* 2006;16:1.
4. Agargun MY, Besiroglu L, Cilli AS, et al. Nightmares, suicide attempts, and melancholic features in patients with unipolar major depression. *J Affect Disord* 2007;98:267-70.
5. Nadorff MR, Anestis MD, Nazem S, Claire Harris H, Samuel Winer E. Sleep disorders and the interpersonal-psychological theory of suicide: independent pathways to suicidality? *J Affect Disord* 2014;152-154:505-12.
6. Sjostrom N, Hetta J, Waern M. Persistent nightmares are associated with repeat suicide attempt: a prospective study. *Psychiatry Research* 2009;170:208-11.
7. Nadorff MR, Nazem S, Fiske A. Insomnia symptoms, nightmares, and suicidal ideation in a college student sample. *Sleep* 2011;34:93-8.
8. Nadorff MR, Nazem S, Fiske A. Insomnia symptoms, nightmares, and suicide risk: duration of sleep disturbance matters. *Suicide Life Threat Behav* 2013;43:139-49.
9. Agargun MY, Cilli AS, Kara H, Tarhan N, Kincir F, Oz H. Repetitive and frightening dreams and suicidal behavior in patients with major depression. *Compr Psychiatry* 1998;39:198-202.
10. Krakow B, Ribeiro JD, Ulibarri VA, Krakow J, Joiner TE Jr. Sleep disturbances and suicidal ideation in sleep medical center patients. *J Affect Disord* 2011;131:422-7.
11. Marinova P, Koychev I, Laleva L, et al. Nightmares and suicide: predicting risk in depression. *Psychiatr Danub* 2014;26:159-64.

12. Levin R, Nielsen TA. Disturbed dreaming, posttraumatic stress disorder, and affect distress: a review and neurocognitive model. *Psychol Bull* 2007;133:482-528.
13. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders (DSM-5)*. Washington, DC: American Psychiatric Publishing, 2013.
14. Pigeon WR, Campbell CE, Possemato K, Ouimette P. Longitudinal relationships of insomnia, nightmares, and PTSD severity in recent combat veterans. *J Psychosom Res* 2013;75:546-50.
15. Germain A. Sleep disturbances as the hallmark of PTSD: where are we now? *Am J Psychiatry* 2013;170:372-82.
16. Panagioti M, Gooding PA, Tarrier N. A meta-analysis of the association between posttraumatic stress disorder and suicidality: the role of comorbid depression. *Compr Psychiatry* 2012;53:915-30.
17. Sareen J, Houlihan T, Cox BJ, Asmundson GJ. Anxiety disorders associated with suicidal ideation and suicide attempts in the National Comorbidity Survey. *J Nerv Ment Dis* 2005;193:450-4.
18. Joiner TE. *Why people die by suicide*. Harvard University Press, 2005.
19. Williams JMG. *Cry of pain*. England: Penguin Books, 1997.
20. Williams JMG, Crane C, Barnhofer T, Duggan DS. Psychology and suicidal behaviour: elaborating the entrapment model In: Hawton K, ed. *Psychology and suicidal behaviour: elaborating the entrapment model*. Oxford: Oxford University Press' 2005:71-89.
21. Johnson J, Gooding P, Tarrier N. Suicide risk in schizophrenia: explanatory models and clinical implications, The Schematic Appraisal Model of Suicide (SAMS). *Psychol Psychother* 2008;81:55-77.
22. O'Connor RC. The integrated motivational-volitional model of suicidal behavior. *Crisis* 2011;32:295-8.
23. Gilbert P, Allan S. The role of defeat and entrapment (arrested flight) in depression: an exploration of an evolutionary view. *Psychol Med* 1998;28:585-98.
24. Baumeister RF. Suicide as escape from self. *Psychol Rev* 1990;97:90-113.
25. Panagioti M, Gooding PA, Tarrier N. Hopelessness, defeat, and entrapment in posttraumatic stress disorder: their association with suicidal behavior and severity of depression. *J Nerv Ment Dis* 2012;200:676-83.
26. Panagioti M, Gooding PA, Tarrier N. A prospective study of suicidal ideation in posttraumatic stress disorder: the role of perceptions of defeat and entrapment. *J Clin Psychol* 2015;71:50-61.
27. O'Connor RC, Nock MK The psychology of suicidal behaviour. *Lancet Psychiatry* 2014;1:73-85.
28. Ehlers A, Clark DM. A cognitive model of posttraumatic stress disorder. *Behav Res Ther* 2000;38:319-45.
29. Foa EB, Cashman L, Jaycox L, Perry K. The validation of a self-report measure of posttraumatic stress disorder: the Posttraumatic Diagnostic Scale. *Psychol Assess* 1997;9:445.
30. Blake DD, Weathers FW, Nagy LM, et al. The development of a Clinician-Administered PTSD Scale. *J Trauma Stress* 1995;8:75-90.
31. Osman A, Bagge CL, Gutierrez PM, Konick LC, Kopper BA, Barrios FX. The Suicidal Behaviors Questionnaire-Revised (SBQ-R): validation with clinical and nonclinical samples. *Assessment* 2001;8:443-54.
32. Beck AT, Weissman A, Lester D, Trexler L The measurement of pessimism: the hopelessness scale. *J Consult Clin Psychol* 1974;42:861-5.
33. Shrout PE, Bolger N. Mediation in experimental and nonexperimental studies: new procedures and recommendations. *Psychol Methods* 2002;7:422-45.
34. Hayes AF. *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guildford Press, 2013.

35. Nielsen T, Levin R. Nightmares: a new neurocognitive model. *Sleep Med Rev* 2007;11:295-310.
36. McNamara P, Auerbach S, Johnson P, Harris E, Doros G. Impact of REM sleep on distortions of self-concept, mood and memory in depressed/anxious participants. *J Affect Disord* 2010;122:198-207.
37. Goldstein AN, Walker MP. The role of sleep in emotional brain function. *Annu Rev Clin Psychol* 2014;10:679-708.
38. Bradley B, DeFife JA, Guarnaccia C, et al. Emotion dysregulation and negative affect: association with psychiatric symptoms. *J Clin Psychiatry* 2011;72:685-91.
39. Agargun MY, Cartwright R. REM sleep, dream variables and suicidality in depressed patients. *Psychiatry Research* 2003;119:33-9.
40. Belleville G, Guay S, Marchand A. Persistence of sleep disturbances following cognitive-behavior therapy for posttraumatic stress disorder. *J Psychosom Res* 2011;70:318-27.
41. Nadorff MR, Lambdin KK, Germain A. Pharmacological and non-pharmacological treatments for nightmare disorder. *Int Rev Psychiatry* 2014;26:225-36.

CHAPTER 6.

6. Short sleep duration and poor sleep quality predict next-day suicidal ideation: An ecological momentary assessment study

This paper has been accepted for publication in *Psychological Medicine*.

Littlewood, D. L., Kyle, S. D., Carter, L. A., Peters, S., Pratt, D., & Gooding, P. (in press). Short sleep duration and poor sleep quality predict next-day suicidal ideation: An ecological momentary assessment study. *Psychological Medicine*.

6.1. Abstract

Background: Sleep problems are a modifiable risk factor for suicidal thoughts and behaviors. Yet, sparse research has examined temporal relationships between sleep disturbance, suicidal ideation, and psychological factors implicated in suicide, such as, entrapment. This is the first in-the-moment investigation of relationships between suicidal ideation, objective and subjective sleep parameters and perceptions of entrapment.

Methods: Fifty-one participants with current suicidal ideation completed week-long ecological momentary assessments. An actigraph watch was worn for the duration of the study which monitored total sleep time, sleep efficiency and sleep latency. Daily sleep diaries captured subjective ratings of the same sleep parameters, with the addition of sleep quality. Suicidal ideation and entrapment were measured at six quasi-random time-points each day. Multi-level random intercept models and moderation analyses were conducted to examine links between sleep, entrapment and suicidal ideation, adjusting for anxiety and depression severity.

Results: Analyses revealed a uni-directional relationship whereby short sleep duration (both objective and subjective measures), and poor sleep quality, predicted higher severity of next-day suicidal ideation. However, there was no significant association between daytime suicidal ideation and sleep the following night. Sleep quality moderated the relationship between pre-sleep entrapment and awakening levels of suicidal ideation.

Conclusions: This is the first study to report night-to-day relationships between sleep disturbance, suicidal ideation and entrapment. Findings suggest that sleep quality may alter the strength of the relationship between pre-sleep entrapment and awakening suicidal ideation. Clinically, results underscore the importance of assessing and treating sleep disturbance when working with those experiencing suicidal ideation.

6.2. Introduction

The most recently released figures indicate that there were 10.4 suicides per 100,000 people in the United Kingdom (Office for National Statistics, 2017), and 13.42 suicides per 100,000 people in the US, in 2016 (Centers for Disease Control and Prevention, 2017). Furthermore, a survey in England revealed that an estimated 20.6% of people have experienced suicidal thoughts during their lifetime, and 6.7% have previously attempted suicide (McManus *et al.*, 2016). Improving the understanding of factors and mechanisms underpinning pathways to suicidal thoughts and attempts is crucial for the development of effective suicide-focused interventions.

One such factor found to be associated with increased vulnerability for suicidal ideation and behaviors is sleep disturbance (Littlewood *et al.*, 2017, Malik *et al.*, 2014, Pigeon *et al.*, 2012). Suicidal ideation has been linked to specific types of sleep problems, such as insomnia (Zuromski *et al.*, 2017) and nightmares (Littlewood *et al.*, 2016b, Nadorff *et al.*, 2014). Specific sleep parameters are also associated with increased likelihood of suicidal thoughts, attempts and death by suicide, including short self-reported sleep duration (Gunnell *et al.*, 2013, Winsler *et al.*, 2015), low sleep efficiency (the proportion of time in bed spent asleep; (Bernert *et al.*, 2017b, Sabo *et al.*, 1991), and poor sleep quality (Bernert *et al.*, 2014, Turvey *et al.*, 2002). Research has largely adopted cross-sectional designs to investigate the association between sleep disturbance and suicidal ideation. This is problematic because of the fluctuation of both sleep problems (Lemola *et al.*, 2013, Vallieres *et al.*, 2005) and suicidal ideation (Ben-Zeev *et al.*, 2012, Kleiman *et al.*, 2017). Hence, such designs fail to characterise the temporal aspects of this relationship. Temporality has been addressed by three studies which investigated the possible bi-directional associations between symptoms of sleep disturbance and suicidal or self-harmful thoughts. In a longitudinal questionnaire study, Ribeiro *et al.* (2012) observed a unidirectional relationship between self-reported insomnia symptoms at baseline, and suicidal ideation one-month later. In a more recent study participants completed six self-

report assessments of insomnia symptoms and suicidal ideation via questionnaires, every three days across a 15-day period (Zuromski *et al.*, 2017). Insomnia symptoms predicted a subsequent increase in frequency and intensity of suicidal ideation, but suicidal ideation failed to predict subsequent changes in insomnia symptoms. A 5-day diary study assessed bi-directional relationships between nightmares and self-harmful thoughts and behaviors in a sample of university students, whilst controlling for depressive symptoms and negative affect (Hochard *et al.*, 2015). A uni-directional relationship was reported whereby the occurrence of nightmares significantly predicted post-sleep self-harming thoughts and behaviors. However, the model which examined the reverse relationship was non-significant.

Overreliance on retrospective, self-report measures of sleep is a considerable limitation of research conducted in this area (Littlewood *et al.*, 2017, Pigeon *et al.*, 2012). Subjective measurement is susceptible to recall biases whereby individuals with mental health problems report greater levels of sleep disturbance when completing retrospective sleep quality questionnaires, such as the Pittsburgh Sleep Quality Index (PSQI; Buysse *et al.*, 1989), in comparison with the data recorded using daily sleep diaries (Hartmann *et al.*, 2015). Alternatively, objective estimates of sleep can be used to address this issue of recall bias. Relatively few studies have used objective estimates of sleep to investigate the association between sleep disturbance and suicidal ideation and behaviors. For example, studies utilizing polysomnography (PSG) have reported associations between suicidal ideation and lower sleep efficiency (Bernert *et al.*, 2017b, Sabo *et al.*, 1991); greater nocturnal awakenings (Ballard *et al.*, 2016, Bernert *et al.*, 2017b); and abnormalities in rapid-eye movement (REM) sleep, such as, increased REM activity and time spent in REM sleep (Agargun and Cartwright, 2003, Keshavan *et al.*, 1994, Sabo *et al.*, 1991). The relationship between sleep disturbance and suicidal ideation was recently examined with wrist actigraphy, which monitors movement through accelerometry to provide an objective estimate of sleep (Bernert *et al.*, 2017a). A sample of university students wore

actigraphy watches for seven days, and completed measures of suicidal ideation at baseline, 7 and 21-days later. Analyses showed that variability in sleep/wake patterns predicted increased suicidal ideation at 7 and 21-day follow up, independent of depressive symptoms (Bernert *et al.*, 2017a).

Although sleep disturbance has been associated with suicidal thoughts and behaviors, not everyone who experiences sleep disturbance will develop suicidal thoughts or attempt suicide. Consequently, it is important to understand the mechanisms by which sleep disturbance may lead to suicidal ideation and behavior. For instance, one such candidate mechanism is entrapment, which is a psychological construct that refers to the desire to escape together with the perception that escape is not possible (Gilbert and Allan, 1998). Contemporary theories of suicidal behavior posit that entrapment is a proximal factor for suicidal thoughts (Johnson *et al.*, 2008, O'Connor, 2011, O'Connor and Portzky, 2018).

Preliminary evidence from three methodologically diverse studies indicate that perceptions of entrapment may be important in understanding the associations between sleep problems, and suicidal thoughts and behaviors (Hochard *et al.*, 2017, Littlewood *et al.*, 2016a, Littlewood *et al.*, 2016b). First, entrapment was shown to partially mediate the relationship between nightmares and suicidal behaviors (Littlewood *et al.*, 2016b). Second, entrapment was found to interact with both insomnia and nightmares to predict suicidal thoughts (Hochard *et al.*, 2017). Both of these studies used cross-sectional designs. Finally, participants in a qualitative study described how sleep provided a welcome escape from suicidal thoughts and mental distress, which for some also produced improved mood and coping abilities on waking (Littlewood *et al.*, 2016a). Taken together, these findings suggest that sleep disturbance may moderate the relationship between pre-sleep entrapment and awakening levels of suicidal ideation.

To develop a deeper understanding of the interrelationships between sleep disturbance, suicidal ideation and entrapment, it is necessary to fulfil three important

goals. First, research should include both objective and subjective assessments of key sleep parameters, which will counter retrospective recall biases. Second, research has yet to examine the bi-directional relationship between sleep disturbance and next-day suicidal ideation; and the ways in which daytime suicidal ideation relates to sleep the subsequent night. This is a surprising gap in the literature, given the wealth of research which indicates that daytime emotions, such as loneliness and low mood, negatively impacts sleep (Kahn *et al.*, 2013, Vandekerckhove and Cluydts, 2010). Third, it is important to examine the interrelationships between sleep disturbance, suicidal ideation and entrapment, which will provide novel insights into the specific pathways by which sleep disturbance contributes to heightened suicidal ideation.

The current study addressed these three key goals using a repeated-sampling method known as ecological momentary assessment (EMA) or the experience sampling methodology (ESM), which refers to the repeated, real-time sampling of individual experience (Larson and Csikszentmihalyi, 1983). The first hypothesis was that sleep disturbance would predict increased severity of next-day suicidal ideation. The second hypothesis was that higher severity of daytime suicidal ideation would predict sleep disturbance the following night. The third hypothesis was that the relationship between pre-sleep entrapment and awakening levels of suicidal ideation would be moderated by poor sleep. For all three hypotheses, the key sleep parameters were both objective and subjective measures of total sleep time, sleep efficiency, and sleep onset latency, and a subjective measure of sleep quality.

Sleep disturbance (Sivertsen *et al.*, 2009) and suicidal thoughts (Chesney *et al.*, 2014) are commonly reported by people with diagnoses of different types of mental health problems. However, given the particularly high incidence of sleep disturbance reported by people with depression (Tsuno *et al.*, 2005), and strong links between depression and suicide (Harris and Barraclough, 1997, Rihmer and Dome, 2016), this study focused on people who had experienced a Major Depressive Episode(s). In addition, by focusing on a

relatively homogeneous group in relation to mental health diagnosis, we sought to reduce variability in, and therefore influence of, medication type and individual sleep architectural profiles. Similarly, in order to reduce between subject variability in sleep patterns, the study focused on a restricted age group (18 - 65 years).

6.3. Methods

6.3.1. Participants.

Participants were recruited from National Health Service (NHS) mental health services, mental health charities and via self-referral (May 2016 – March 2017). There were eight inclusion criteria: 1) experience of a Major Depressive Episode(s) according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and confirmed by the Structured Clinical Interview for DSM Disorders (SCID; First *et al.*, 1997), 2) poor sleep quality as indicated by a score of >5 on the PSQI (Buysse *et al.*, 1989), 3) self-reported suicidal thoughts and/or behaviors in the past month, 4) aged 18 to 65 years, 5) fluent in English, 6) no self-reported previous diagnosis of schizoaffective disorders or personality disorders, 7) no current symptoms of mania or hypomania, 8) no self-reported previous diagnosis of organic sleep disorders (i.e., narcolepsy, sleep breathing disorder, parasomnias). Participants received £30 compensation for their involvement in the study.

6.3.2. Measures and procedure.

The current study received ethical approval from the local NHS research ethics committee (ref: 16/NW/0226). There were four phases to this study which were 1) screening, 2) pre-EMA assessment and briefing, 3) 7-day EMA study, and 4) debriefing.

6.3.2.1. Screening.

The SCID (First *et al.*, 1997) was administered to confirm experience(s) of major depressive episode(s) and no current symptoms of mania or hypomania. The SCID is extensively used as the criterion standard for depressive disorders (Lowe *et al.*, 2004).

Screening for poor sleep quality was conducted with the PSQI, which is a 19-item questionnaire that measures sleep quality over the past month (Buysse *et al.*, 1989). A cut-off score of greater than five has demonstrated high sensitivity (89.6%) and specificity (86.5%) in differentiating individuals with good versus poor sleep quality (Buysse *et al.*, 1989).

6.3.2.2. *Pre-EMA assessment and briefing.*

First, participants completed demographical and questionnaire measures. Demographical information included the participant's gender, age, ethnicity, employment status, marital status, living circumstances, diagnosed mental health problems and current anti-depressant medication. Self-report measures of sleep (Sleep Condition Indicator; SCI), suicidal ideation (Beck Scale for Suicidal Ideation; BSSI), symptoms of depression (Beck Depression Inventory II; BDI-II) and anxiety (trait portion of the State Trait Anxiety Inventory; STAI-T) were also administered (see Table 6.1). Measures of depression and anxiety were included as possible confounding variables, given their strong interrelationships with sleep disturbance and suicidal ideation (Harris and Barraclough, 1997, Tsuno *et al.*, 2005). The BDI-II and STAI-T are recommended for examining mood within insomnia research (Buysse *et al.*, 2006). To avoid any conflation in the effect size, a modified depressive symptoms score was calculated by subtracting the sleep item (Q16) and suicidal item (Q9) from the total BDI-II score (identified as MBDI-II). Details of the questionnaire measures are provided in Table 6.1.

Table 6.1. *Descriptive statistics for pre-EMA measures of sleep, suicidal ideation, depression and anxiety.*

Questionnaire measure	Score interpretation guidance	Median (IQR)	Range
Pittsburgh Sleep Quality Index (PSQI; Buysse <i>et al.</i> , 1989)	Total scores can range from 0 – 21, with higher scores indicating worse sleep quality. A PSQI score of >5 indicates poor sleep quality.	13 (10 - 16)	6 - 19
Sleep Condition Indicator (SCI; Espie <i>et</i>	Total scores can range from 0 to 32, and higher scores are indicative of	8 (3 -11)	0 – 26

<i>al.</i> , 2014)	better sleep. SCI score of ≤ 16 corresponds with a probable diagnosis of insomnia disorder.		
Beck Scale for Suicidal Ideation (BSSI; Beck <i>et al.</i> , 1988)	Total scores can range from 0 to 38, and higher scores suggest greater levels of suicidal thoughts and behaviors	15 (9 - 19)	0 – 28
Beck Depression Inventory II (BDI-II; Beck <i>et al.</i> , 1996)	Total scores can range from 0 to 63, and higher scores indicate greater severity of depressive symptoms	38 (28 - 48)	14 – 56
State Trait Anxiety Inventory (STAI-T; Spielberger, 1983)	Higher scores specify greater trait anxiety, with a possible total score ranging from 20 to 80.	65 (58 - 72)	33 - 78

Next, participants were given a detailed briefing of the EMA procedure to allow them to become familiar with the sleep diary used to collect subjective sleep data, and the PRO-Diary watch (CamNtech, Cambridge, UK) which collected objective sleep and EMA data. Daily sampling windows were agreed with participants, based on their habitual sleep and wake times with the aim of minimizing possible disruption of sleep due to diary alerts (Mulligan *et al.*, 2016).

6.3.2.3. Seven day EMA study procedure.

All participants were asked to wear a PRO-diary actigraph watch (CamNtech, Cambridge, UK) on their non-dominant wrist for 24-hours per day for seven-days. The watch contains an accelerometer unit which captures activity in 30-second epochs and can be used to estimate sleep and wake. Software sleep scoring algorithms were applied to extract three nightly objective sleep parameters: 1) sleep efficiency (proportion of time spent in bed asleep; %), 2) sleep onset latency (time taken to fall asleep; mins), and 3) total sleep time (total time spent asleep according to actigraph wake/sleep categorisation; hours). A previous study validated the accelerometer unit against PSG, to demonstrate its ability to provide reliable estimations of total sleep time, sleep onset latency and sleep efficiency (Elbaz *et al.*, 2012).

On waking each morning, participants completed the morning section of the expanded Consensus Sleep Diary, which consisted of ten questions relating to their previous night's sleep (Carney *et al.*, 2012). From this data, nightly subjective measures of sleep efficiency, sleep onset latency, and total sleep time (time spent sleeping from intention to sleep, to final wake time) were calculated. Furthermore, subjective sleep quality was measured with the question '*How would you rate the quality of your sleep?*', based on a 5-point rating scale, ranging from very poor (1) to very good (5).

During the day, the watch alerted participants at six quasi-random time-points to complete the set of in-the-moment EMA items. To capture in-the-moment assessments across different time-points, each individual's waking hours were split into six sampling windows, with the alert sounding at a random time within each window. All items were scored using a 7-point Likert scale, 1= '*not at all*' to 7= '*very much so*'. Suicidal ideation was assessed by the item '*Right now I am feeling suicidal.*' Perceptions of entrapment were assessed by two items, which were designed to capture the desire to escape emotional pain '*Right now I want to escape my emotional pain,*' and perceptions that escape was prevented '*Right now I feel trapped*'. The mean value was calculated for the sum of the two items, to give the entrapment score.

6.3.2.4. Debriefing.

At the end of the seven-day EMA study period, participants returned the PRO-Diary watch and sleep diary, and were de-briefed in accordance with guidance for conducting EMA studies with people experiencing mental health problems (Palmier-Claus *et al.*, 2011). The researcher checked the data collected by the watch and sleep diary, and clarified any ambiguities due to missing data (e.g., the watch had been removed due to participant swimming) or unclear responses (e.g., illegible handwriting on the sleep diary).

6.3.3. Statistical analysis.

Data analysis was conducted using STATA version 14. Grand medians, inter-quartile ranges (IQR) and ranges were calculated for all variables, as appropriate for the distribution of the data. The intraclass correlation coefficient was calculated for each variable to indicate the proportion of between-person and within-person variance. Data collected within this study were nested at three-levels, namely, 1) participant, 2) day (seven days), 3) EMA suicidal ideation and entrapment items (six times per day). Consequently, multilevel regression models were used to account for the nested-nature of the data (Snijders and Bosker, 1999). Sleep variables were measured at the day-level. Therefore, it was appropriate to calculate the daily mean of the suicidal ideation items to provide a day-level measure of suicidal ideation.

To test the first hypothesis that poor objective and subjective sleep parameters would predict next-day suicidal ideation, seven separate, two-level random intercept models were calculated. In each model, pre-EMA depression (MBDI-II) and anxiety (STAI-T) were included as control variables. To avoid multicollinearity, each of the seven sleep parameters (subjective total sleep time, objective total sleep time, subjective sleep efficiency, objective sleep efficiency, subjective sleep onset latency, objective sleep onset latency, and subjective sleep quality) were entered into separate regression models as predictor variables. Day-level suicidal ideation was entered as the outcome variable in each model.

To examine the second hypothesis, namely, that higher severity of daytime levels of suicidal ideation would predict poor objective and subjective sleep measures the subsequent night, a further seven separate, two-level random intercept models were calculated. Again, pre-EMA depression (MBDI-II) and anxiety (STAI-T) were entered as control variables, with day-level suicidal ideation as the predictor variable. Each model examined one of the seven specified sleep parameters as the outcome variable.

A final hypothesis examined a moderational pathway whereby the relationship between pre-sleep entrapment (at timepoint 6, i.e., the last measurement of the day) and awakening suicidal thoughts (at timepoint 1, i.e., the first measurement of the subsequent day) was moderated by poor sleep. First, the predictor and covariate variables were grand mean-centered. Seven separate two-level random intercept models were calculated to examine the possible moderation effects of each of the seven sleep parameters which were acting as moderators. Pre-sleep entrapment was entered as the predictor variable, awakening suicidal thoughts as the outcome variable, and moderation was evaluated using the interaction between the predictor and moderator variable. Pre-EMA depression (MBDI-II) and anxiety (STAI-T) were entered as control variables.

Significance was evaluated at $p < .05$ for all analyses. Post-estimation residuals were plotted to assess normality of the distribution of outcome variables via histograms. A maximum likelihood estimation approach was taken which allowed all available data to be included in the analysis.

6.4. Results

6.4.1. Participants.

Fifty-four eligible participants were recruited into the study. An additional 23 people were screened but did not meet the full eligibility criteria for the study. Three individuals withdrew; two due to equipment failure problems and one withdrew on day one, after experiencing anxiety due to the random timing of the sampling schedule. The final sample comprised 51 individuals. The majority of participants were recruited via self-referral from the community ($n = 29$), with the remaining participants recruited via NHS mental health services ($n = 15$) or mental health charities ($n = 7$). Sixty-seven percent of the sample were female ($n = 34$) and the overall mean age was 35.47 years ($SD = 12.81$, range 18- 65 years). Most participants reported having previously made at least one suicide attempt ($n = 36$, 71%), chronic sleep problems lasting a year or more ($n = 43$,

84%), and currently taking anti-depressant medication ($n = 34$, 67%). Ninety-eight percent of participants ($n = 50$) reported suicidal ideation during the seven-day EMA sampling period (defined as at least one EMA suicidal ideation item score of >1). Descriptive statistics for the questionnaire measures are provided in Table 6.1, and descriptive statistics for the nightly objective and subjective sleep parameters, and EMA suicidal ideation and entrapment items are provided in Table 6.2.

Table 6.2. *Descriptive statistics for daily measures of sleep and in-the-moment measures of suicidal ideation and entrapment.*

Variable	Data type	Median (IQR)	Range	Intraclass correlation coefficient
Total sleep time (mins)	Subjective	420 (318 – 485)	0 – 805	.33
	Objective	409 (358 – 452)	37 – 706	.42
Sleep efficiency (%)	Subjective	81.37 (68.28 – 90.67)	0 – 100	.35
	Objective	79.65 (71.4 – 85.5)	22.9 – 99.9	.52
Sleep onset latency (mins)	Subjective	30 (14 – 60)	0 – 380	.35
	Objective	11 (1 – 37)	0 – 323	.36
Sleep quality (1 – 5 very good)	Subjective	3 (2 – 3)	1 – 5	.35
Suicidal ideation (1-7 high)	EMA	2 (1 – 4)	1 – 7	.52
Entrapment (1-7 high)	EMA	4 (2.5 – 5.5)	1 – 7	.58

6.4.2. Adherence.

Adherence to actigraphy monitoring, sleep diary and suicidal ideation EMA items surpassed suggested minimum compliance levels of more than one third complete entries per participant (Palmier-Claus *et al.*, 2011). Overall, the sample completed 85% of suicidal ideation EMA items (1822/2147 items), 86% of entrapment EMA items

(1839/2147 items), 91% of nights were monitored by actigraphy (326/357 nights), and 94% of nights were reported via the sleep diaries (334/357 nights).

6.4.3. Does sleep disturbance predict higher levels of next-day suicidal ideation?

Table 6.3 summarises the results of the seven, two-level, random intercept models calculated to examine the extent to which objective and subjective sleep measures predicted next-day suicidal ideation, adjusting for anxiety and depression symptom severity. Objective and subjective total sleep time, and subjective sleep quality significantly predicted suicidal ideation the following day. Specifically, less objective and subjective total sleep time, and poor sleep quality were associated with higher levels of next-day suicidal ideation. However, there were no significant associations between objective or subjective measures of sleep efficiency and next-day suicidal ideation.

Table 6.3. *Effect of objective and subjective sleep parameters on next-day suicidal ideation (controlling for anxiety and depression symptom severity).*

Predictor variable	Measure type	Unstandardized β Coefficient	SE	Standardized β Coefficient	<i>p</i>	95% Confidence Intervals (CI)
Total Sleep Time (hours)	Subjective	-0.0528	0.0233	-0.0801	0.024	-0.0984 to -0.0071
	Objective	-0.0760	0.0320	-0.0876	0.018	-0.1387 to -0.0133
Sleep Efficiency (%)	Subjective	-0.0027	0.0028	-0.0344	0.346	-0.0082 to 0.0029
	Objective	-0.0088	0.0052	-0.0683	0.093	-0.0190 to 0.0015
Sleep Onset Latency (mins)	Subjective	0.0006	0.0009	0.0250	0.491	-0.0011 to 0.0023
	Objective	0.0006	0.0012	0.0179	0.616	-0.0018 to 0.0031
Sleep Quality (score 1-5)	Subjective	-0.1520	0.0504	-0.1093	0.003	-0.2508 to -0.0532

Note. Outcome measure = suicidal ideation, scored on 1 (not at all) to 7 (very much so).

6.4.4. Do high levels of daytime suicidal ideation predict sleep disturbance the subsequent night?

Table 6.4 shows results of seven two-level random intercept models calculated to test the reverse relationship, namely, that daytime levels of suicidal ideation predict objective and subjective sleep parameters the subsequent night. All analyses were non-significant.

Table 6.4. *Effect of suicidal ideation on objective and subjective sleep parameters the following night (controlling for anxiety and depression symptom severity).*

Outcome variable	Measure type	Unstandardized β Coefficient	SE	Standardized β Coefficient	p	95% Confidence Intervals (CI)
Total Sleep Time (hours)	Subjective	-0.0621	0.1023	-0.0408	0.544	-0.2627 to 0.1385
	Objective	-0.0046	0.0831	-0.0040	0.956	-0.1674 to 0.1583
Sleep Efficiency (%)	Subjective	-0.7041	0.8728	-0.0543	0.420	-2.4149 to 1.0066
	Objective	0.3834	0.5746	0.0493	0.505	-0.7429 to 1.5096
Sleep Onset Latency (mins)	Subjective	-1.9257	2.8661	-0.0464	0.502	-7.5431 to 3.6918
	Objective	-1.2015	2.0887	-0.0417	0.565	-5.2952 to 2.8923
Sleep Quality (score 1-5)	Subjective	-0.0257	0.0499	-0.0358	0.606	-0.1235 to 0.0720

Note. Predictor measure = suicidal ideation, scored on 1 (not at all) to 7 (very much so).

6.4.5. Is the relationship between pre-sleep entrapment and awakening suicidal ideation moderated by poor sleep?

A two-level multilevel model revealed a significant moderation effect of sleep quality, on the relationship between pre-sleep entrapment and awakening suicidal ideation, whilst controlling for pre-EMA depression and anxiety ($B = -0.0909$, 95% CI $-0.1797 - -0.0022$, $p = 0.045$). Figure 6.1 illustrates that when people reported poor sleep quality,

higher pre-sleep entrapment was associated with increased awakening suicidal ideation. However, objective and subjective measures of total sleep time (objective $B = 0.0076$, 95% CI $-0.0547 - 0.0700$, $p = 0.810$; subjective $B = -0.0025$, 95% CI $-0.0458 - 0.0408$, $p = 0.909$), sleep efficiency (objective $B = -0.0078$, 95% CI $-0.0183 - 0.0028$, $p = 0.148$; subjective $B = -0.0027$, 95% CI $-0.0078 - 0.0024$, $p = 0.304$), or sleep onset latency (objective $B = 0.0012$, 95% CI $-0.0014 - 0.0038$, $p = 0.370$; subjective $B = 0.0006$, 95% CI $-0.0013 - 0.0025$, $p = 0.526$), did not moderate the association between pre-sleep entrapment and awakening suicidal ideation.

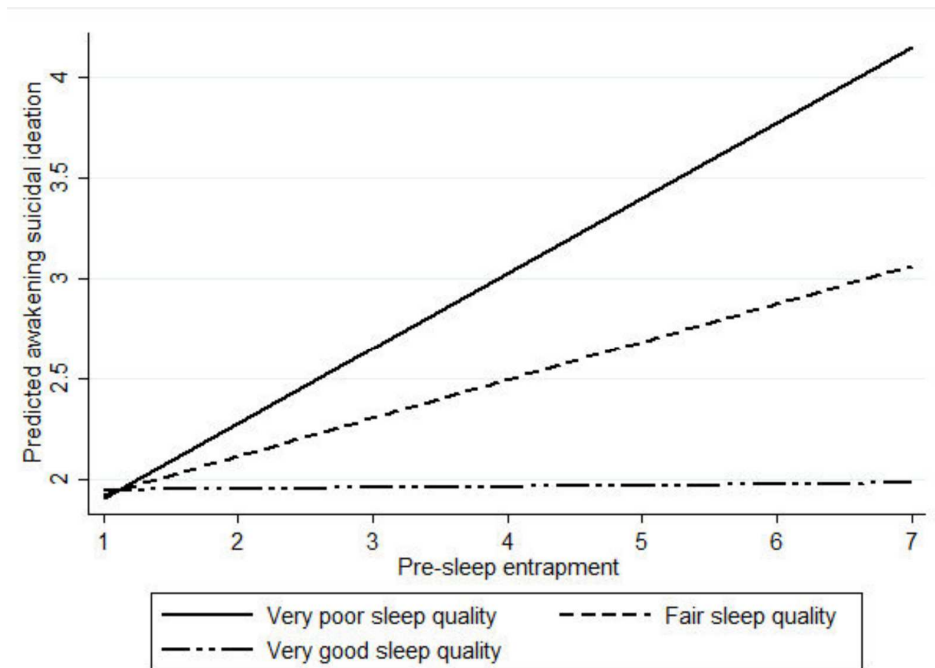


Figure. 6.1. Moderation effects of sleep quality on the relationship between pre-sleep entrapment and awakening suicidal ideation.

6.5. Discussion

This study provides the first in-the-moment examination of relationships between objective and subjective sleep parameters, suicidal ideation and entrapment. With respect to the first hypothesis, analyses revealed a unidirectional association between sleep disturbance and suicidal ideation. Specifically, shorter objective and subjective sleep duration and poor sleep quality predicted next-day suicidal ideation, after adjusting for anxiety and depression symptom severity. However, estimates of sleep efficiency and

sleep onset latency, did not predict next-day suicidal ideation. In relation to the second hypothesis, daytime suicidal ideation did not predict objective or subjective sleep parameters the following night. Finally, the third hypothesis investigated mechanistic pathways, which showed that only subjective sleep quality significantly moderated the association between pre-sleep entrapment and awakening levels of suicidal ideation.

These findings are in accord with previous research which has shown an association between self-reported short sleep duration and suicidal thoughts and behaviors (Gunnell *et al.*, 2013, Winsler *et al.*, 2015). However, contrary to the second hypothesis, severity of daytime suicidal ideation did not predict sleep disturbance the subsequent night. Here, our results extend the literature that has reported temporal precedence between sleep disturbance and suicidal ideation (Ribeiro *et al.*, 2012, Zuromski *et al.*, 2017), to show that poor sleep duration preceded increased severity of next-day suicidal ideation.

With regard to sleep quality, these results provide convergent evidence that subjective ratings of sleep quality are associated with suicidal ideation and behavior (Bernert *et al.*, 2014, Turvey *et al.*, 2002). Although estimates of sleep quality were based on individual's subjective perceptions, research has shown that ratings of sleep quality are positively associated with objective measures of slow wave sleep (SWS; Åkerstedt *et al.*, 1997), which occurs during non-rapid eye movement (NREM) sleep. Measurement of sleep architecture was beyond the scope of the present study. However, there are corroborative findings from a recent PSG study which reported that current suicidal ideation was associated with less NREM stage four sleep (Bernert *et al.*, 2017b). SWS is thought to serve a restorative function, re-establishing synaptic homeostasis (Tononi and Cirelli, 2006); while insufficient SWS is associated with deficits in cognitive functioning (Lowe *et al.*, 2017). Therefore, research should seek to examine the extent to which the relationship between poor sleep quality, less SWS and suicidal ideation, is mediated by cognitive functioning.

Recent research has sought to understand the psychological mechanisms which contribute to the relationship between sleep disturbance and suicidal thoughts and behaviors (for a review see, Littlewood *et al.*, 2017). The current study advances the cross-sectional literature by conducting the first temporal investigation of the interrelationships between sleep disturbance, suicidal ideation and entrapment. Perceptions of sleep quality were found to moderate the relationship between pre-sleep entrapment and awakening levels of suicidal ideation. Specifically, when people reported poor ratings of sleep quality, higher pre-sleep entrapment was associated with increased awakening levels of suicidal ideation. Conversely, when individuals had high pre-sleep entrapment but reported good sleep quality, they reported lower levels of awakening suicidal ideation. A note of caution is warranted here since the moderational effect of sleep quality yielded a p-value of 0.045 and therefore replication is necessary with a larger sample size. However, these findings are consistent with a previous cross-sectional study which reported a significant interaction effect between entrapment and symptoms of sleep disturbance (insomnia and nightmares) in predicting suicidal symptoms (Hochard *et al.*, 2017). Moreover a qualitative study found that sleep provided an escape from problems; and when individuals failed to escape via sleep, they described increased levels of suicidal thoughts (Littlewood *et al.*, 2016a). Interestingly, findings in the current study appeared to be specific to subjective sleep quality, as opposed to the other measures of sleep efficiency, sleep duration or sleep onset latency. Given that subjective ratings of sleep quality may be influenced by mood on awakening, this finding should be treated cautiously as preliminary evidence which requires further empirical investigation.

The extent to which findings from this study generalize to other populations is an empirical question for future research. That said, the associations between sleep quality, sleep duration and suicidal ideation have been reported across different populations, using different methodological designs (Gunnell *et al.*, 2013, Krakow *et al.*, 2011, Winsler *et al.*, 2015). Furthermore, the moderation effect of sleep quality on the association between

entrapment and suicidal ideation, builds on the cross-sectional findings of Hochard and colleagues (2017), in which the sample largely comprised university students. Taken together, this provides preliminary evidence that the relationships reported in this study are not specific to those with depressive disorders. Contextually, it is important to note that participants in this study experienced prominent levels of clinical symptoms in that 98% reported suicidal ideation on one or more occasion during the study and 84% endured chronic sleep problems. This underscores the clinical importance of screening and treating sleep problems when working with individuals who experience suicidal thoughts. Specifically, findings from the current study suggest that restoring healthy sleep duration and perceptions of sleep quality may be particularly effective in reducing incidence of suicidal ideation. Furthermore, sleep may offer a temporary relief from waking problems, which may be helpful alongside interventions which seek to establish a more permanent resolution to the distressing problem. Promising pilot work shows that psychological interventions for sleep disturbance, such as Cognitive Behavioral Therapy for insomnia and Imagery Rehearsal Therapy for nightmares, may engender improvements in both sleep and suicidal thoughts (Christensen *et al.*, 2016, Ellis *et al.*, 2017, Trockel *et al.*, 2015). However, it is unlikely that symptoms of sleep disturbance in isolation will offer clinical utility in the prediction and prevention of suicidal ideation. Indeed, it is improbable that any single risk factor will predict suicidal thoughts or behaviors with a high degree of accuracy (Franklin *et al.*, 2017). Future research should examine the role of sleep duration and sleep quality in combination with a large range of other risk factors in predicting suicidal thoughts and behaviors (Franklin *et al.*, 2017).

The current study has three key strengths. First, the micro-longitudinal EMA design is optimal for examining experiences of individuals as they occur in real-time. This is important when attempting to understand factors which amplify and protect against mental health problems (Kleiman *et al.*, 2017). In addition, because assessments were based on in-the-moment ratings, the EMA design did not suffer from any recall biases.

Second, there was excellent adherence to the EMA schedule, completion of sleep diaries and actigraphy monitoring. Compliance has been identified as a key issue when conducting EMA research (Palmier-Claus *et al.*, 2011). Furthermore, the current study illustrates that individuals who were currently experiencing significant and severe symptoms of mental health problems should not be excluded from EMA designed studies. Third, sampling schedules were customized to individual's habitual sleep/wake times to minimize possible disruption to their sleep (Mulligan *et al.*, 2016). Surprisingly, this is a key departure from previous EMA protocols, which tend to follow seminal guidance by Larson and Csikszentmihalyi (1983) by standardizing sampling schedules from 8:00 to 22:00 (e.g., Ben-Zeev *et al.*, 2012). If this approach had been adopted in the current study it is likely to have impacted on ecological validity, given that 49% ($n = 25$) of participants reported sleep/wake schedules which would have been interrupted by alerts sounding during the recommended sampling window.

Notwithstanding the contributions made by this study, three limitations should be noted. First, whilst actigraphy provided an objective estimate of sleep that can be easily administered in the natural environment it cannot characterize sleep architecture which would require assessment via PSG (Ancoli-Israel *et al.*, 2015). Second, in-the-moment suicidal ideation was assessed using a single item. Consequently, it is possible that this item alone may not provide as comprehensive measurement of suicidal thoughts in comparison with a multi-item questionnaire. Future research should consider additional items which seek to investigate different aspects of suicidal ideation, such as the intention to act on thoughts or ability to control intrusive thoughts (Van Spijker *et al.*, 2014). Third, individuals with diagnosed organic sleep disorders, such as sleep apnea, were excluded from this study. It is possible that participants may have disorders that are yet to be diagnosed.

6.6. Conclusion

The current study provides the first EMA examination of the temporal bidirectional associations between suicidal ideation and objective and subjective sleep parameters. In conducting a micro-longitudinal study, this advances the field by identifying specific parameters of sleep which predict next-day suicidal ideation, independent of anxiety or depression symptoms. Specifically, short objective and subjective sleep duration, and poor perceptions of sleep quality predicted increased levels of suicidal ideation the following day. However, suicidal ideation during the day did not predict sleep the subsequent night. A moderation pathway indicated that poor sleep quality has the propensity to alter the strength of the association between pre-sleep entrapment and levels of suicidal ideation on awakening. These findings emphasize the importance of assessing sleep in individuals experiencing suicidal ideation and providing interventions targeted at boosting sleep duration and quality of sleep.

6.7. References

- Agargun MY, Cartwright R** (2003). REM sleep, dream variables and suicidality in depressed patients. *Psychiatry Research* **119**, 33-39.
- Åkerstedt T, Hume K, Minors D, Waterhouse J** (1997). Good sleep—its timing and physiological sleep characteristics. *Journal of Sleep Research* **6**, 221-229.
- Ancoli-Israel S, Martin JL, Blackwell T, Buenaiver L, Liu L, Meltzer LJ, Sadeh A, Spira AP, Taylor DJ** (2015). The SBSM guide to actigraphy monitoring: clinical and research applications. *Behavioral Sleep Medicine* **13**, S4-S38.
- Ballard ED, Vande Voort JL, Bernert RA, Luckenbaugh DA, Richards EM, Niciu MJ, Furey ML, Duncan WC Jr., Zarate CA Jr.** (2016). Nocturnal Wakefulness Is Associated With Next-Day Suicidal Ideation in Major Depressive Disorder and Bipolar Disorder. *The Journal of Clinical Psychiatry* **77**, 825-831.
- Beck AT, Steer RA, Brown GK** (1996). *Manual for the Beck Depression Inventory*, 2nd edn. Psychological Corporation: San Antonio, Tx.
- Beck AT, Steer RA, Ranieri WF** (1988). Scale for suicide ideation: Psychometric properties of a self-report version. *Journal of Clinical Psychology* **44**, 499-505.
- Ben-Zeev D, Young MA, Depp CA** (2012). Real-time predictors of suicidal ideation: mobile assessment of hospitalized depressed patients. *Psychiatry Research* **197**, 55-59.
- Bernert RA, Hom MA, Iwata NG, Joiner TE** (2017a). Objectively Assessed Sleep Variability as an Acute Warning Sign of Suicidal Ideation in a Longitudinal Evaluation of Young Adults at High Suicide Risk. *The Journal of Clinical Psychiatry* **78**, e678-e687.
- Bernert RA, Luckenbaugh DA, Duncan WC, Iwata NG, Ballard ED, Zarate CA** (2017b). Sleep architecture parameters as a putative biomarker of suicidal ideation in treatment-resistant depression. *Journal of Affective Disorders* **208**, 309-315.

Bernert RA, Turvey CL, Conwell Y, Joiner TE Jr. (2014). Association of poor subjective sleep quality with risk for death by suicide during a 10-year period: A longitudinal, population-based study of late life. *JAMA Psychiatry* **71**, 1129-1137.

Buyse DJ, Ancoli-Israel S, Edinger JD, Lichstein KL, Morin CM (2006). Recommendations for a standard research assessment of insomnia. *Sleep* **29**, 1155-1173.

Buyse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Research* **28**, 193-213.

Carney CE, Buysse DJ, Ancoli-Israel S, Edinger JD, Krystal AD, Lichstein KL, Morin CM (2012). The consensus sleep diary: standardizing prospective sleep self-monitoring. *Sleep* **35**, 287-302.

Centers for Disease Control and Prevention Web-based injury statistics query and reporting system (<https://webappa.cdc.gov/sasweb/ncipc/mortrate.html>). Accessed 2 March 2018.

Chesney E, Goodwin GM, Fazel S (2014). Risks of all-cause and suicide mortality in mental disorders: a meta-review. *World Psychiatry* **13**, 153-160.

Christensen H, Batterham PJ, Gosling JA, Ritterband LM, Griffiths KM, Thorndike FP, Glozier N, O'Dea B, Hickie IB, Mackinnon AJ (2016). Effectiveness of an online insomnia program (SHUTi) for prevention of depressive episodes (the GoodNight Study): a randomised controlled trial. *The Lancet Psychiatry* **3**, 333-341.

Elbaz M, Yaury K, Metlaine A, Martoni M, Leger D (2012). Validation of a new actigraph motion watch versus polysomnography on 70 healthy and suspected sleep-disordered subjects. *Journal of Sleep Research* **21**, 218.

Ellis TE, Rufino KA, Nadorff MR (2017). Treatment of Nightmares in Psychiatric Inpatients With Imagery Rehearsal Therapy: An Open Trial and Case Series. *Behavioral Sleep Medicine*, 1-14.

Espie CA, Kyle SD, Hames P, Gardani M, Fleming L, Cape J (2014). The Sleep Condition Indicator: a clinical screening tool to evaluate insomnia disorder. *BMJ open* **4**, e004183.

First M, Spitzer R, Gibbon M, Williams JB (1997). *Structured clinical interview for DSM-IV clinical version (SCID-I/CV)*. American Psychiatric Press: Washington, DC.

Franklin JC, Ribeiro JD, Fox KR, Bentley KH, Kleiman EM, Huang X, Musacchio KM, Jaroszewski AC, Chang BP, Nock MK (2017). Risk factors for suicidal thoughts and behaviors: A meta-analysis of 50 years of research. *Psychological Bulletin* **143**, 187-232.

Gilbert P, Allan S (1998). The role of defeat and entrapment (arrested flight) in depression: an exploration of an evolutionary view. *Psychological Medicine* **28**, 585-598.

Gunnell D, Chang SS, Tsai MK, Tsao CK, Wen CP (2013). Sleep and suicide: an analysis of a cohort of 394,000 Taiwanese adults. *Social Psychiatry and Psychiatric Epidemiology* **48**, 1457-1465.

Harris EC, Barraclough B (1997). Suicide as an outcome for mental disorders. A meta-analysis. *The British Journal of Psychiatry* **170**, 205-228.

Hartmann JA, Carney CE, Lachowski A, Edinger JD (2015). Exploring the construct of subjective sleep quality in patients with insomnia. *The Journal of Clinical Psychiatry* **76**, e768-73.

Hochard KD, Heym N, Townsend E (2015). The unidirectional relationship of nightmares on self-harmful thoughts and behaviors. *Dreaming* **25**, 44-58.

Hochard KD, Heym, N, Townsend E (2017). Investigating the Interaction Between Sleep Symptoms of Arousal and Acquired Capability in Predicting Suicidality. *Suicide and Life-Threatening Behavior* **47**, 370-381.

Johnson J, Gooding P, Tarrier N (2008). Suicide risk in schizophrenia: explanatory models and clinical implications, The Schematic Appraisal Model of Suicide (SAMS). *Psychology and Psychotherapy: Theory, Research and Practice* **81**, 55-77.

Kahn M, Sheppes G, Sadeh A (2013). Sleep and emotions: bidirectional links and underlying mechanisms. *International Journal of Psychophysiology* **89**, 218-228.

Keshavan MS, Reynolds CF, Montrose D, Miewald J, Downs C, Sabo EM (1994). Sleep and suicidality in psychotic patients. *Acta Psychiatrica Scandinavica* **89**, 122-125.

Kleiman EM, Turner BJ, Fedor S, Beale EE, Huffman JC, Nock MK (2017). Examination of real-time fluctuations in suicidal ideation and its risk factors: Results from two ecological momentary assessment studies. *Journal of Abnormal Psychology* **126**, 726-738.

Krakow B, Ribeiro JD, Ulibarri VA, Krakow J, Joiner TE Jr. (2011). Sleep disturbances and suicidal ideation in sleep medical center patients. *Journal of Affective Disorders* **131**, 422-427.

Larson R, Csikszentmihalyi M (1983). The experience sampling method. *New Directions for Methodology of Social & Behavioral Science*.

Lemola S, Ledermann T, Friedman EM (2013). Variability of sleep duration is related to subjective sleep quality and subjective well-being: an actigraphy study. *PLoS One* **8**, e71292.

Littlewood D, Kyle SD, Pratt D, Peters S, Gooding P (2017). Examining the role of psychological factors in the relationship between sleep problems and suicide. *Clinical Psychology Review* **54**, 1-16.

Littlewood DL, Gooding P, Kyle SD, Pratt D, Peters S (2016a). Understanding the role of sleep in suicide risk: qualitative interview study. *BMJ Open* **6**, e012113.

Littlewood DL, Gooding PA, Panagioti M, Kyle SD (2016b). Nightmares and Suicide in Posttraumatic Stress Disorder: The Mediating Role of Defeat, Entrapment, and Hopelessness. *Journal of Clinical Sleep Medicine* **12**, 393-399.

Lowe B, Kroenke K, Herzog W, Grafe K (2004). Measuring depression outcome with a brief self-report instrument: sensitivity to change of the Patient Health Questionnaire (PHQ-9). *Journal of Affective Disorders* **81**, 61-66.

Lowe CJ, Safati A, Hall PA (2017). The neurocognitive consequences of sleep restriction: A meta-analytic review. *Neuroscience & Biobehavioral Reviews* **80**, 586-604.

Malik S, Kanwar A, Sim LA, Prokop LJ, Wang Z, Benkhadra K, Murad MH (2014). The association between sleep disturbances and suicidal behaviors in patients with psychiatric diagnoses: a systematic review and meta-analysis. *Systems Review* **3**, 18.

McManus S, Bebbington P, Jenkins R, Brugha T (2016). *Mental health and wellbeing in England: Adult Psychiatric Morbidity Survey 2014*. NHS Digital: Leeds.

Mulligan LD, Haddock G, Emsley R, Neil ST, Kyle SD (2016). High resolution examination of the role of sleep disturbance in predicting functioning and psychotic symptoms in schizophrenia: A novel experience sampling study. *Journal of Abnormal Psychology* **125**, 788-797.

Nadorff MR, Anestis MD, Nazem S, Harris HC, Winer ES (2014). Sleep disorders and the interpersonal–psychological theory of suicide: Independent pathways to suicidality? *Journal of Affective Disorders* **152**, 505-512.

O'Connor RC (2011). The integrated motivational-volitional model of suicidal behavior. *Crisis* **32**, 295-298.

O'Connor RC, Portzky G (2018). The relationship between entrapment and suicidal behavior through the lens of the integrated motivational–volitional model of suicidal behavior. *Current Opinion in Psychology* **22**, 12-17.

Office for National Statistics Suicides in the UK: 2016 registrations. (<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/death/s/bulletins/suicidesintheunitedkingdom/2016registrations>). Accessed 2 March 2018.

Palmier-Claus JE, Myin-Germeyns I, Barkus E, Bentley L, Udachina A, Delespaul PA, Lewis SW, Dunn G (2011). Experience sampling research in individuals with mental illness: reflections and guidance. *Acta Psychiatrica Scandinavica* **123**, 12-20.

Pigeon WR, Pinquart M, Conner K (2012). Meta-analysis of sleep disturbance and suicidal thoughts and behaviors. *The Journal of Clinical Psychiatry* **73**, e1160-7.

- Ribeiro JD, Pease JL, Gutierrez PM, Silva C, Bernert RA, Rudd MD, Joiner TE Jr.** (2012). Sleep problems outperform depression and hopelessness as cross-sectional and longitudinal predictors of suicidal ideation and behavior in young adults in the military. *Journal of Affective Disorders* **136**, 743-750.
- Rihmer Z, Dome P** (2016). Major Mood Disorders and Suicidal Behavior. In *The International Handbook of Suicide Prevention*, 2nd edn. (ed. R. C. O'Connor and J. Pirkis), pp. 74-92. Wiley-Blackwell: Chichester.
- Sabo E, Reynolds CF, Kupfer DJ, Berman SR** (1991). Sleep, depression, and suicide. *Psychiatry Research* **36**, 265-77.
- Sivertsen B, Krokstad S, Øverland S, Mykletun A** (2009). The epidemiology of insomnia: Associations with physical and mental health.: The HUNT-2 study. *Journal of Psychosomatic Research* **67**, 109-116.
- Snijders T, Bosker R** (1999). *Multilevel analysis: An introduction to basic and applied multilevel analysis*. Sage: London.
- Spielberger CD** (1983). *Manual for the State-Trait Anxiety Inventory STAI (Form Y)('Self-Evaluation Questionnaire')*. Consulting Psychologists Press: Palo Alto, CA.
- Tononi G, Cirelli C** (2006). Sleep function and synaptic homeostasis. *Sleep Medicine Reviews* **10**, 49-62.
- Trockel M, Karlin BE, Taylor C, Brown GK, Manber R** (2015). Effects of cognitive behavioral therapy for insomnia on suicidal ideation in veterans. *Sleep* **38**, 259-265.
- Tsuno N, Besset A, Ritchie K** (2005). Sleep and depression. *The Journal of Clinical Psychiatry* **66**, 1254-69.
- Turvey CL, Conwell Y, Jones MP, Phillips C, Simonsick E, Pearson JL, Wallace R** (2002). Risk factors for late-life suicide: a prospective, community-based study. *American Journal of Geriatric Psychiatry* **10**, 398-406.
- Vallieres A, Ivers H, Bastien CH, Beaulieu-Bonneau S, Morin CM** (2005). Variability and predictability in sleep patterns of chronic insomniacs. *Journal of Sleep Research* **14**, 447-453.
- Van Spijker BA, Batterham PJ, Calear AL, Farrer L, Christensen H, Reynolds J, Kerkhof AJ** (2014). The Suicidal Ideation Attributes Acale (SIDAS): Community-based validation study of a new scale for the measurement of suicidal ideation. *Suicide and Life-Threatening Behavior* **44**, 408-419.
- Vandekerckhove M, Cluydts R** (2010). The emotional brain and sleep: an intimate relationship. *Sleep Medicine Reviews* **14**, 219-26.
- Winsler A, Deutsch A, Vorona RD, Payne PA, Szklo-Coxe M** (2015). Sleepless in Fairfax: the difference one more hour of sleep can make for teen hopelessness, suicidal ideation, and substance use. *Journal of Youth and Adolescence* **44**, 362-78.
- Zuromski KL, Cero I, Witte TK** (2017). Insomnia symptoms drive changes in suicide ideation: A latent difference score model of community adults over a brief interval. *Journal of Abnormal Psychology* **126**, 739-749.

CHAPTER 7

7. Discussion

This thesis had two overarching aims. First, to develop a more refined understanding of the relationships between sleep disturbance and suicidal thoughts and behaviours. Second, to examine the psychological factors and processes that underpin these relationships. Consequently, a mixed methods approach was taken which sought to address these aims using a range of methodologies, namely, a systematic review, a qualitative interview study, a cross-sectional secondary analysis, and an ecological momentary assessment study. This discussion chapter begins with a summary of key findings from the systematic review and empirical research undertaken. Consideration is given to the strengths and limitations of the overarching approach taken within this thesis. Theoretical implications of the empirical work, and comparison with the wider literature is provided. Finally, clinical implications and suggestions for future research are discussed.

7.1. Summary of key findings

Table 7.1 provides an overview of the key findings reported in the empirical chapters within this thesis.

Table 7.1. *Overview of novel findings reported in this thesis.*

Chapter number	Study design	Novel findings
3	Systematic Review	First systematic review and critical appraisal of literature that has examined interrelationships between sleep disturbance, suicidal thoughts and behaviours, and psychological factors. Review identified strongest evidence in support of the role of three types of psychological factors, namely, negative cognitive appraisals, social isolation and thwarted belongingness, and maladaptive emotion regulation strategies. Findings were integrated with theory to develop a clear research agenda culminating in a series of hypotheses to drive subsequent research in this area.

4	Qualitative semi-structured interview	Being awake in the night was perceived as a vulnerable time for a suicide attempt. Failure to achieve good sleep compromised the ability to manage mental wellbeing. Sleep provided a temporary escape from waking-life problems. Although, this may not be as relevant to those who experience traumatic nightmares. This suggests that the relationship between nightmares and suicidal thoughts and behaviours may operate via different pathways.
5	Quantitative cross-sectional, analysis of existing dataset	Nightmares were associated with suicidal behaviours, after controlling for co-morbid symptoms of insomnia. Relationship between nightmares and suicidal behaviour was partially mediated by perceptions of defeat, entrapment and hopelessness.
6	Quantitative ecological momentary assessment	Micro-longitudinal evidence demonstrated that symptoms of sleep disturbance predicted next-day suicidal ideation, but day-time suicidal ideation did not predict sleep disturbance the following evening. Identified specific parameters of sleep disturbance, namely sleep quality, and sleep duration, which appeared to increase next-day frequency of suicidal ideation. However, sleep efficiency and sleep onset latency were not significantly associated with next-day suicidal ideation. Temporal evidence supported the pathway identified in the qualitative study and systematic review, whereby sleep quality had the propensity to alter the strength of relationship between pre-sleep entrapment and awakening suicidal ideation. When people reported poor sleep quality, high levels of pre-sleep entrapment predicted increased levels of suicidal ideation on awakening. However, when people reported good sleep quality, high levels of pre-sleep entrapment were associated with comparatively lower levels of suicidal ideation on awakening.

To date, nine reviews (Bernert & Joiner, 2007; Bernert, Kim, Iwata, & Perlis, 2015; Bernert & Nadorff, 2015; Liu & Buysse, 2006; McCall & Black, 2013; Norra, Richter, & Juckel, 2011; Singareddy & Balon, 2001; Winsper & Tang, 2014; Woznica, Carney, Kuo, & Moss, 2015) and two meta-analyses (Malik et al., 2014; Pigeon, Pinquart, et al., 2012) have examined the relationship between sleep disturbance and suicidal thoughts and behaviours. However, none had investigated the interrelationships with psychological factors. This is of critical importance, given that not everyone who experiences sleep disturbance reports suicidal thoughts and/or behaviours. Hence, Chapter

3 featured the first systematic review of the literature that has examined interrelationships between sleep disturbance, suicidal thoughts and behaviours, and psychological factors.

Findings from the review indicated that the relationship between sleep disturbance and suicidal thoughts and behaviours may operate via negative cognitive appraisals, social isolation and thwarted belongingness, and maladaptive emotion regulation (Chapter 3; Littlewood, Kyle, Pratt, Peters, & Gooding, 2017). However, the evidence indicated that interrelationships with psychological factors may differ dependent on the symptoms of sleep disturbance assessed, i.e. insomnia versus nightmares (Golding et al., 2015; Nadorff, Anestis, et al., 2014).

The results from the review were integrated with psychological theories of suicide (Johnson et al., 2008; Joiner, 2005; O'Connor, 2011; Van Orden et al., 2010), to develop a series of suggested research hypotheses which addressed the second overarching aim of this thesis. Two of these pathways were tested in the cross-sectional (Chapter 5; Littlewood, Gooding, Panagioti, & Kyle, 2016) and ecological momentary assessment studies (Chapter 6; Littlewood et al., in press).

Current theoretical models of suicide do not explicitly account for the relationship between sleep disturbance and suicidal thoughts and behaviours. Therefore, a qualitative approach was adopted to understand how individuals perceive sleep as a contributor to suicidal pathways (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016). Qualitative methodology was chosen because the research question was focused on developing a more *in-depth understanding* of the association between sleep disturbance and suicidal thoughts and behaviours (Hjelmeland & Knizek, 2010). Given the strong interrelationships between sleep disturbance, suicide and depression (e.g., Harris & Barraclough, 1997; Tsuno, 2005), this study was conducted with individuals who had experienced a major depressive episode(s).

This was the first qualitative examination in this area, and an inductive, thematic analysis highlighted three pathways which illustrated participants' perceptions of the psychological factors that may account for the relationship between sleep disturbance and suicidal thoughts and behaviours (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016). First, daytime consequences of poor sleep (i.e. increased feelings of fatigue, negative thinking and irritability), compromised the ability to manage mental health. This is consistent with the literature which shows deficits in cognitive (Lim & Dinges, 2010), emotional (Kahn et al., 2013), and social functioning (Beattie, Kyle, Espie, & Biello, 2015) following sleep loss.

Second, when people experienced times of despair and distress, sleep was seen as a coping mechanism which provided a temporary escape, and in this sense was identified as an alternative to suicide. However, this pathway was less pertinent to those who experienced traumatic nightmares. This suggests that the association between traumatic nightmares and suicidal thoughts and behaviours may operate via a different pathway (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016).

Third, being awake in the night was identified as an opportune time to attempt suicide, because there is a reduced chance of someone intervening to prevent the suicide. In addition, coping with suicidal thoughts and mental health was viewed as difficult during the night, since access to professional and social support was reduced. This link between nocturnal awakening and suicidal behaviour is consistent with work by Perlis, Grandner, Chakravorty, et al. (2016), who used the US National Violent Death Reporting system to analyse the number of suicides per hour. Yet, unlike previous studies they adjusted for the percentage of the population likely to be awake at that time (Perlis, Grandner, Brown, et al., 2016). This confirmed that once these adjustments were made, being awake during the night was associated with the greater risk of suicide, in comparison with daytime hours (Perlis, Grandner, Brown, et al., 2016). In addition, polysomnography research has shown that nocturnal awakening between 4:00am and

4:59am was associated with higher levels of next-day suicidal ideation (Ballard et al., 2016).

Findings from the systematic review (Chapter 3; Littlewood et al., 2017) and qualitative interview study (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016) indicated that interrelationships between psychological factors, sleep disturbance and suicidal thoughts and behaviours may differ depending on the specific symptom of sleep disturbance experienced. In Chapter 5, a theoretically-driven mechanistic pathway investigated the extent to which nightmares were related to suicidal behaviour independent of insomnia, and whether this relationship functioned via perceptions of defeat, entrapment and hopelessness (Littlewood, Gooding, Panagioti, et al., 2016). These hypotheses were tested using an existing cross-sectional dataset of people who had experienced trauma and symptoms of PTSD. First, hierarchical regression models showed a relationship between frequency and intensity of nightmares and suicidal behaviours, after adjusting for co-morbid symptoms of insomnia and depression (Chapter 5; Littlewood, Gooding, Panagioti, et al., 2016). The second part of the analyses tested a theoretically defined, mediational pathway. Here, nightmares were indirectly related to suicidal behaviour via perceptions of defeat, entrapment and hopelessness. However, the direct effect between nightmares and suicidal behaviour remained significant (see Figure 5.2). This infers that additional factors beyond defeat, entrapment and hopelessness, underpin the association between nightmares and suicidal behaviour. It is important to note that the cross-sectional design of this study prevents causal interpretation regarding the temporal aspect of the relationship between these factors.

The final study employed a repeated-sampling method which is known as ecological momentary assessment (EMA) or experience sampling methodology (Larson & Csikszentmihalyi, 1983). This was used to assess temporal relationships between specific symptoms of sleep disturbance and suicidal ideation, using both objective and subjective measures (Chapter 6; Littlewood et al., in press). As stated earlier, research examining the

association between sleep disturbance and suicidal thoughts and behaviour has predominantly used cross-sectional questionnaire designs. These studies are likely to be subject to recall bias (Davidson et al., 2017), and also fail to assess the intrapersonal variability in suicidal ideation and sleep patterns. In addition, no previous research had used objective and subjective assessment of sleep to examine the extent to which symptoms of sleep disturbance predict increased suicidal ideation the following day, or whether day-time suicidal ideation predicts sleep disturbance the subsequent night. Thus, these questions were addressed in the EMA study. Main analyses identified the specific symptoms of sleep disturbance that appear to increase next-day severity of suicidal ideation, namely, poor sleep quality, and short sleep duration (Chapter 6; Littlewood et al., in press). However, suicidal ideation did not predict sleep disturbance the following night. It is notable that symptoms of depression and anxiety were included as control variables within these analyses. Therefore, this provides additional evidence to suggest that depression does not fully account for the association between symptoms of sleep disturbance (in this case short sleep duration and poor sleep quality), and suicidal ideation.

The EMA study also tested a hypothesis which featured in the systematic review (Chapter 3; Littlewood et al., 2017), and stemmed from the qualitative study (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016), whereby the association between pre-sleep entrapment and awakening suicidal ideation was moderated by sleep parameters. It was found that sleep quality, but not sleep duration, altered the strength of the relationship between pre-sleep entrapment and awakening suicidal ideation. Importantly, this provides convergent evidence to indicate that improving perceptions of sleep quality may alleviate suicidal ideation.

Taken together, findings from the empirical chapters have key implications regarding the role of sleep in theoretical models of suicide and in clinical practice. These implications will be discussed in sections 7.3. and 7.4.

7.2. Strengths and limitations of overarching methodological approach

The specific strengths and limitations of each study have been discussed within each of the empirical chapters. However, it is important to provide a broader critical evaluation of the overarching methodological approaches taken throughout this thesis.

7.2.1. Overarching strengths.

Critical appraisal frameworks for mixed methods research projects consistently emphasise: 1) the need to provide a clear rationale for the use of mixed methods research, and 2) appraisal of the integration of the quantitative and qualitative findings (Heyvaert, Hannes, Maes, & Onghena, 2013). Rationale for the use of qualitative and quantitative methods in this thesis was based on two key factors. First, methods were selected that were well-placed to address the specific research questions. For example, Chapter 4 addressed a research question which sought to understand perceptions of the role of sleep in suicidal pathways. Qualitative methodology was chosen as this allows in-depth investigation into ‘*understanding*’ complex experiences (Hjelmeland & Knizek, 2016).

Second, the collective use of different methodologies was able to effectively counter methodological limitations encountered when using such designs in isolation (Creswell, 2014; Onwuegbuzie & Leech, 2005). For instance, the qualitative interview study provided detailed insight into participants’ beliefs regarding the role of sleep in contributing to suicidal thoughts and behaviours (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016). However, findings were based on retrospective participant accounts, and hence, were subject to recall bias (Hassan, 2006). The EMA study (Chapter 6; Littlewood et al., in press) countered this limitation through sampling participants current, in-the-moment thoughts and experiences (Davidson et al., 2017).

Integration of the different research studies was achieved by conducting the empirical investigations sequentially. This approach was advantageous because it allowed the findings from one study to be utilised to inform the development of research questions

for the subsequent studies. Specifically, the systematic review (Chapter 3; Littlewood et al., 2017) and qualitative interview study (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016) provided a broad overview of the interrelationship between sleep disturbance, suicidal thoughts and behaviours and psychological factors. Whilst in the EMA (Chapter 6; Littlewood et al., in press) and cross-sectional studies (Chapter 5; Littlewood, Gooding, Panagioti, et al., 2016), the focus was narrowed to examine specific symptoms of sleep disturbance in relation to suicidal thoughts and behaviours. In addition, the EMA study also examined the extent to which symptoms of sleep disturbance moderated the role between pre-sleep entrapment and awakening suicidal ideation. This built on a pathway outlined in the thematic analysis (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016), and depicted in the visual schematic of psychological factors provided in the systematic review (see Figure 3.2; Littlewood et al., 2017). Moreover, in Chapter 5, a different mediational pathway was examined within the context of nightmares and suicidal behaviours (Littlewood, Gooding, Panagioti, et al., 2016).

7.2.2. Overarching limitations.

The operationalisation of suicidal behaviours within this thesis, failed to assess the broader concept of self-harm. The extent to which acts of self-harm can be discretely separated on the basis of intent is contested (for further discussion see Kapur et al., 2013). When questioned about suicidal intent in relation to self-harm, 42% of adolescents reported that they ‘did not mind whether they lived or died’, in comparison to those who stated they did (34%), or did not want to die (24%) (Hawton, Cole, O’Grady, & Osborn, 1982). Indeed, when participants were asked about history of suicide behaviour during the studies comprised in this thesis, some participants were uncertain because they questioned the level of suicidal intent attached to previous acts of self-harm.

It is not possible to predict how the thesis findings would have differed if empirical investigation had explicitly assessed self-harm, rather than suicidal behaviours. However, an interesting comparison can be made between the qualitative study presented in Chapter

4 (Littlewood, Gooding, Kyle, et al., 2016) and a study by Townsend and colleagues (2016) which investigated factors which contribute to first, and most recent acts of self-harm. In relation to first acts of self-harm, difficulty sleeping was associated with withdrawing from others, whilst in the most recent acts of self-harm, difficulties in sleeping was associated with feelings of agitation and restlessness, and a subsequent inability to disclose their feelings to others (Townsend et al., 2016). These pathways show some similarities to those described in the qualitative interviews presented in Chapter 4. Descriptions of daytime consequences of poor sleep included feelings of irritability, frustration and anger which led to a withdrawal from others (Littlewood, Gooding, Kyle, et al., 2016).

The research conducted as part of this thesis investigated the association between symptoms of sleep disturbance and suicidal thoughts and behaviours. However, the empirical investigations failed to account for the role of circadian patterning of sleep, such as chronotype preference, which was deemed beyond the scope of this thesis. Chronotype refers to an individual's preference for timing of their sleep-wake cycle, which is commonly operationalised as the extent to which someone is considered a morning or evening person (Roenneberg, 2015). Broadly, evening preference is associated with increased risk of negative physical and mental health outcomes, such as diabetes and depression (Fabbian et al., 2016). Studies which have examined the association between chronotype and suicidal thoughts and behaviours have produced mixed findings (Rumble et al., 2018). Specifically, some studies have shown a link between evening chronotype and suicidal thoughts (e.g., Bahk, Han, & Lee, 2014; Chan et al., 2014). In contrast to this, studies which have included depression (Lester, 2015) and sleep quality (Selvi et al., 2010) as control variables, found no significant association between chronotype and suicidal ideation.

In addition to chronotype, further investigation of the impact of dysregulated circadian rhythms is warranted. In the qualitative study, participants recognised that

disrupted sleeping patterns negatively affected their ability to manage their mental health and suicidal thoughts (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016). Specifically, sleeping during the daytime was associated with negative self-appraisals, e.g., I am lazy, and also reduced the likelihood that the individual would pursue positive activities, such as socialising, or exercising. The link between daytime routine and dysfunctional circadian rhythms is emphasised in the social zeitgeber theory of depression (Ehlers, Frank, & Kupfer, 1988; Ehlers, Kupfer, Frank, & Monk, 1993). Social zeitgebers refer to aspects of our social environment which shape a sleep-wake routine, such as work, or cohabiting with a partner. Here, the loss of a social zeitgeber, disrupts an individual's daily routine, which consequently upsets their circadian rhythm, and increases vulnerability for depression (Ehlers et al., 1988; Ehlers et al., 1993). Thus, future research should test this pathway from the qualitative study by examining the extent to which sleep-wake timing is related to negative self-appraisals, and suicidal ideation.

7.3. Interrelationships between sleep disturbance, suicidal thoughts and behaviours and entrapment: What does this mean for theory?

This section considers the key theoretical implications from this body of work, namely the role of entrapment in the association between sleep disturbance and suicidal thoughts and behaviours. Focus will be given to how these findings relate to two contemporary theories of suicidal behaviour which are the Schematic Appraisals Model of Suicide (SAMS; Johnson et al., 2008) and the Integrated Motivational-Volitional model of suicidal behaviour (IMV; O'Connor, 2011). These theories were chosen because they have built on the seminal Cry of Pain model (Williams, 1997; Williams et al., 2005) to provide clear and testable accounts for the role of entrapment in suicidal pathways.

Entrapment is said to reflect a desire to escape a distressing state, coupled with the perception that escape is blocked (Gilbert & Allan, 1998). It follows that entrapment is theorised to be central to the emergence of suicidal thinking (for further discussion see section 1.1.2.). Findings from this thesis indicate that entrapment may play an important

role in the association between sleep disturbance and suicidal thoughts and behaviours. Furthermore, the role of entrapment appeared to differ dependent on the specific symptoms of sleep disturbance. There was evidence to support two alternative pathways (see Figures 7.1. and 7.2.).

In Figure 7.1, entrapment is conceptualised as part of a psychological mechanism. Here, perceptions of entrapment contribute to a four-step mediational pathway which partially accounts for the relationship between frequency and intensity of nightmares and suicidal thoughts and behaviours (Chapter 5; Littlewood, Gooding, Panagioti, et al., 2016). Specifically, there was both a direct relationship between nightmares and suicidal behaviours and an indirect relationship which operated through defeat, to entrapment, and then hopelessness (see Figure 7.1).

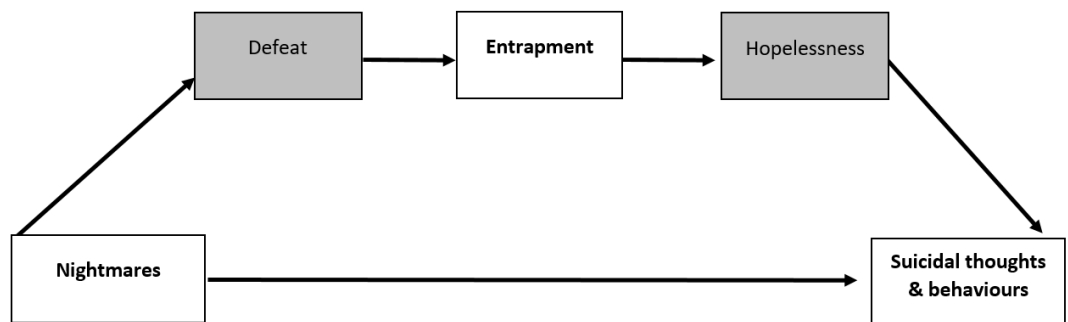


Figure 7.1. Model illustrates the role of entrapment in relation to the association between nightmares and suicidal thoughts and behaviours (Chapter 5).

Convergent evidence for this model was recently reported in a cross-sectional study with adolescents (Russell, Rasmussen, & Hunter, in press). In accord with findings presented in Chapter 5, perceptions of defeat and entrapment partially accounted for the relationship between nightmares and suicidal ideation, after controlling for comorbid symptoms of insomnia and depression (Russell et al., in press). In addition, the authors also examined different symptoms of sleep disturbance, namely, insomnia. Interestingly, perceptions of defeat and entrapment fully mediated the association between insomnia and suicidal ideation, after controlling for comorbid nightmares and depression (Russell et al.,

in press). This difference in findings between insomnia and nightmares, reinforces the notion that symptoms of sleep disturbance may contribute to suicidal thoughts and behaviours via different pathways. However, it is important to note that this evidence is purely cross-sectional, hence prevents causal inferences.

The second pathway posits that subjective perceptions of sleep quality can amplify suicidal ideation (see Figure 7.2.). In this pathway, sleep quality is theorised to act as a moderator in the relationship between entrapment and suicidal ideation. This proposed pathway evolved from the qualitative study, in which participants perceived sleep to be a means to escape their mental health and waking-life problems (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016). Conversely, it could be expected that when escape via sleep is prevented, perceptions of entrapment may trigger thoughts of suicide as an alternative mechanism to escape. Although this was the first empirical study to report this finding, this notion was first proposed in 1964 by Edwin Shneidman. Based on testimony from participants at his suicide research centre he posited that sleep provided “a temporary death, an escape from the world” (Shneidman, 1964, p. 102).

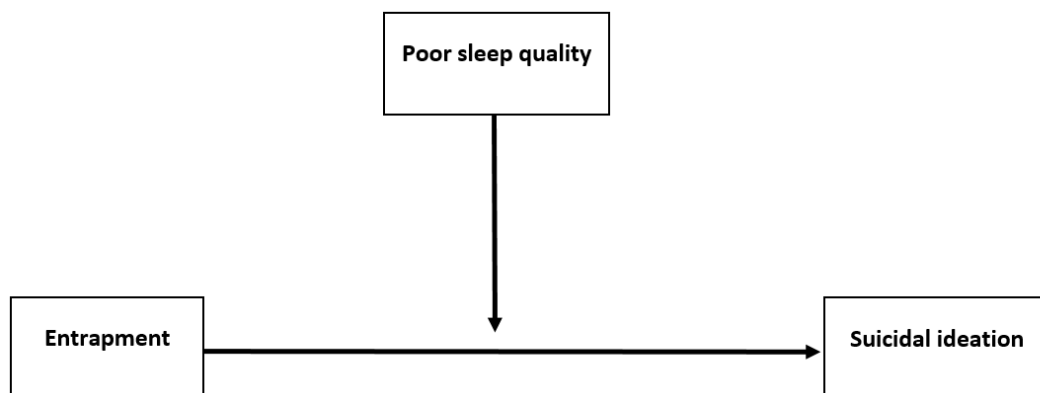


Figure 7.2. Model illustrates the role of entrapment in relation to the association between poor sleep quality and suicidal thoughts and behaviours (Chapters 4 and 6).

The EMA study reported in Chapter 6 provides support for the pathway shown in Figure 7.2. Findings advanced the literature by reporting a temporal moderational pathway, where ratings of sleep quality had the propensity to alter the strength of the relationship between entrapment and suicidal ideation. High pre-sleep entrapment was

associated with the highest levels of awakening suicidal ideation, in instances when the individual experienced poor sleep quality during the intervening night. However, if an individual with high pre-sleep entrapment subsequently reported good sleep quality, then this predicted reduced levels of awakening suicidal ideation (see Figure 6.1). Convergent evidence for this pathway was reported in a cross-sectional study identified in the systematic review (Chapter 3; Littlewood et al., 2017). Hochard, Heym, and Townsend (2017) showed that perceptions of entrapment interacted with insomnia and nightmares to predict suicidal thoughts and plans. High entrapment combined with greater severity of insomnia or nightmares predicted higher levels of suicidal thoughts and plans. In comparison, high entrapment combined with low levels of insomnia or nightmares, was associated with comparably lower levels of suicidal thoughts and plans (Hochard, Heym, et al., 2017).

Having considered the interaction effects when individuals reported high levels of entrapment, it is also important to reflect on the association between symptoms of sleep disturbance and suicidal ideation, when individuals reported low levels of entrapment. In both studies, low levels of entrapment were associated with low levels of suicidal ideation, irrespective of whether the participants reported symptoms of sleep disturbance (Hochard, Heym, et al., 2017; Chapter 5; Littlewood, Gooding, Panagioti, et al., 2016). This provides preliminary evidence to suggest that symptoms of sleep disturbance may be related to suicidal thoughts and behaviours, only in instances when the individual has high entrapment.

7.3.1. Implications for the Schematic Appraisals Model of Suicide (SAMS; Johnson et al., 2008).

The SAMS is a cognitive model in which suicidal behaviour is proposed to stem from the interplay between three components, namely, information-processing biases, suicide schema and appraisals (Johnson et al., 2008). In this model, negative appraisals are central to suicidal pathways. Specifically, when an individual negatively appraises

themselves, their situation, or their own abilities to cope, problem solve or obtain social support, this can lead to perceptions of defeat and entrapment, which subsequently can trigger suicidal thoughts and behaviours (Johnson et al., 2008). This pathway was reflected in the narratives of participants in Chapter 4 (Littlewood, Gooding, Kyle, et al., 2016). Here, poor sleep was perceived to have a negative effect on the individual's ability to process information, cope with emotions, and access social support (see bold pathway in Figure 7.3).

Appraisals of sleep, it can be argued, represent a situational appraisal. Therefore, the mediational pathway between nightmares and suicidal behaviour fit with the existing pathway described by proponents of the SAMS (see Figure 7.3). In addition, the current thesis also provides evidence to suggest a revision to the SAMS, whereby perceptions of poor sleep quality acts as a moderator in the pathway between entrapment and suicidal ideation (as illustrated by the dotted line in Figure 7.3). It is important for further research to use longitudinal designs to provide a more detailed account of the interplay between situational appraisals, entrapment and suicidal ideation over different time periods.

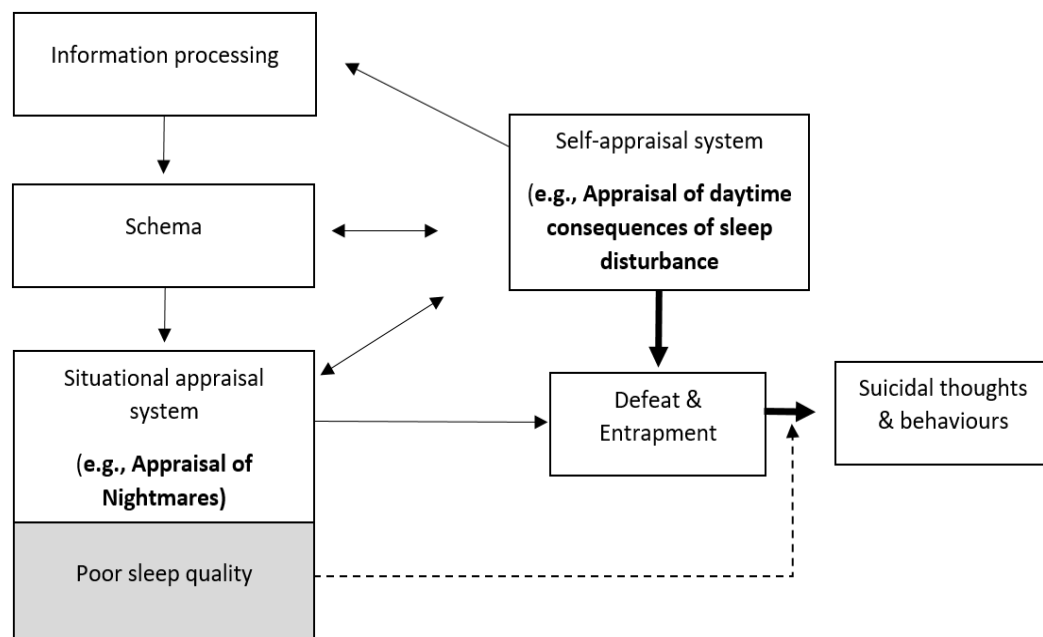


Figure 7.3. The Schematic Appraisals Model of Suicide (Johnson et al., 2008), adapted to illustrate proposed poor sleep quality pathway.

7.3.2. Implications for the Integrated Motivational-Volitional Model of Suicidal behaviour (IMV; O'Connor, 2011).

According to the IMV model of suicidal behaviour, formation of suicidal thoughts and intent are a result of perceptions of entrapment, which in turn stem from perceptions of defeat and humiliation (see Figure 7.4; O'Connor, 2011). The model also identifies a series of moderating factors which can impact the probability that an individual will transition from defeat to entrapment, and from entrapment to suicidal ideation. The hypothesised pathway described in Chapter 5, places nightmares as a background factor that may induce stress, which in turn triggers perceptions of defeat (Littlewood, Gooding, Panagioti, et al., 2016).

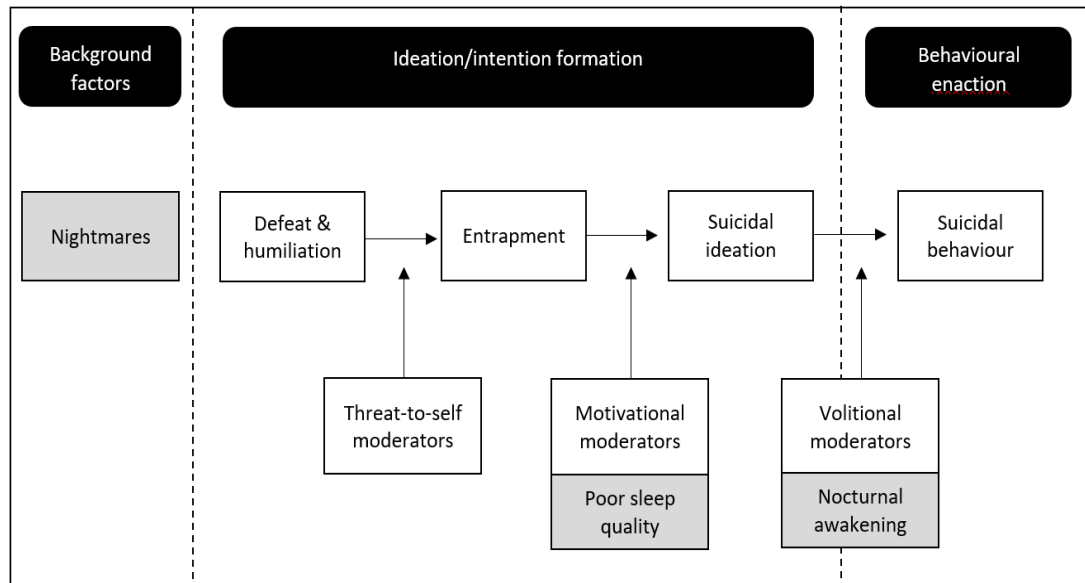


Figure 7.4. The integrated motivational-volitional model of suicide behaviour (O'Connor, 2011), adapted to illustrate proposed nightmares, poor sleep quality pathway and nocturnal awakening.

Participants in Chapter 4 highlighted that nocturnal awakening was a particularly vulnerable time for a suicide (Littlewood, Gooding, Kyle, et al., 2016). This was due to reduced access to support, and consequently a reduced likelihood that someone would intervene to prevent a suicide attempt. This suggests that nocturnal awakening can act as a 'volitional moderator' (see Figure 7.4). However, the temporal aspect of these two pathways remain untested.

Findings from the qualitative (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016) and EMA studies (Chapter 6; Littlewood et al., in press) suggested that poor sleep quality may moderate the association between entrapment and suicidal ideation. Thus, it would appear that sleep quality could be described as a ‘motivational moderator’, as depicted in Figure 7.4.

7.4. Clinical implications

Broadly, there are three key findings from this thesis which have clinical implications relating to i) assessment, ii) formulation, and iii) intervention, when working with those who experience suicidal thoughts and behaviours. First, nightmares were associated with suicidal behaviour, after controlling for co-morbid insomnia (Chapter 5; Littlewood, Gooding, Panagioti, et al., 2016). Second, a uni-directional relationship was found between poor sleep quality, short sleep duration, and suicidal ideation (Chapter 6; Littlewood et al., in press). Third, the relationship between entrapment and suicidal ideation was moderated by sleep quality (Chapters 4 and 6). Taken together, these results indicate that restoring healthy sleep may be associated with a reduction in severity of suicidal ideation.

7.4.1. Assessment of sleep disturbance.

Findings from the thesis add to the growing evidence base which indicates that sleep disturbance is a risk factor for suicidal thoughts and behaviours (Malik et al., 2014; Pigeon, Pinquart, et al., 2012). In addition, early identification and treatment of sleep disturbance has been highlighted as a potential avenue to prevent onset of depression (Baglioni, Spiegelhalder, Nissen, & Riemann, 2011), which in turn is associated with increased risk of death by suicide (Hawton et al., 2013). Results from this thesis reinforce the importance of incorporating routine screening for sleep disturbance into the wider health assessments of those who are at increased risk of, or currently experiencing, poor mental wellbeing and suicidal thoughts and/or behaviours. Recent research highlighted

that clinicians in community mental health teams do not routinely assess for sleep disturbance and experience problems in recalling the full diagnostic criteria for insomnia (O'Sullivan, Rahim, & Hall, 2015). The introduction of brief screening instruments into service delivery may aid clinicians to assess for sleep disturbance. For example the Sleep Condition Indicator (Espie et al., 2014) consists of 8-items which assess against the DSM-V diagnostic criteria for Insomnia Disorder (Espie et al., 2014). Moreover, the British Association for Psychopharmacology suggested five initial screening questions to support clinicians in identifying sleep disorders, including parasomnias such as nightmares (Wilson et al., 2010).

7.4.2. Incorporating sleep disturbance into case formulation.

Both the integrated model provided in Figure 3.2 in the systematic review (Chapter 3; Littlewood et al., 2017), and conceptual model in Figure 4.1 in the qualitative study (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016), could be used to guide clinicians when incorporating the role of sleep disturbance into case formulations for individuals with suicidal thoughts and behaviours. Specifically, when working with people who have sleep disturbance and suicidal thoughts, it may be prudent to map both the night-time and daytime consequences of sleep disturbance. In addition, it may be useful to gain insight into the clients views regarding sleep as a potential response to entrapment and suicidal thoughts (Chapter 3 4, 5, 6). Nocturnal awakening can trigger negative and ruminative thinking which may lead to suicidal thoughts and behaviours (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016). Therefore, it is important to identify what support the client can access, specifically during the night. Daytime consequences of sleep disturbance include reduced cognitive and physical resources which may hinder the ability to effectively regulate emotions, or practise coping strategies such as seeking social support (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016). During case formulation, it may be useful to discuss the client's perceptions of any apparent daytime impairment which stems from sleep disturbance. Finally, based on theory that the function of suicidal behaviour is

to achieve escape from perceptions of defeat (Johnson et al., 2008; Williams, 1997; Williams et al., 2005), it is important to include any apparent relationship between perceptions of entrapment and sleep within the case formulation. For clients who report sleeping as a means to ‘escape,’ it would be sensible to identify additional methods to cope during such times of distress. In contrast, individuals who experience traumatic nightmares, may find that this contributes to their sense of entrapment and hopelessness. By incorporating the role of sleep into formulations of suicidal thoughts and behaviours, clinicians can then develop targeted intervention plans.

7.4.3. Intervention targeted at sleep disturbance and psychological factors in context of suicidal pathways.

Findings from this thesis have implications for interventions which target sleep disturbance, and psychological factors, in relation to suicide prevention.

7.4.3.1. Sleep interventions.

Sleep disturbance increases vulnerability for the development of mental health problems (Baglioni, Battagliese, et al., 2011). In this sense, sleep disturbance could be posited to represent a distal risk factor for suicide. However, findings from the qualitative (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016) and EMA studies (Chapter 6; Littlewood et al., in press) indicate that sleep disturbance may also act as a more proximal factor, by amplifying severity of suicidal ideation amongst those who are experiencing symptoms of depression and anxiety. When working with those who are currently experiencing suicidal thoughts it is key to provide support to prevent them acting on those thoughts. Participants in the qualitative study perceived sleep as an alternative to suicide, providing a temporary escape in times of great distress (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016). In this context, it is important to consider whether it is suitable to prescribe medication to aid sleep as a means of providing a helpful short-term coping strategy. Promoting healthy sleep should also be a long-term goal of treatment plans.

Cognitive behavioural therapy for insomnia (CBT-I) has been shown to be effective in improving both symptoms of insomnia, and comorbid symptoms of mental health problems (Hedges $g = 0.76$; Wu et al., 2015). Two studies have assessed the impact of CBT-I on co-morbid suicidal thoughts and reported a reduction in insomnia severity symptoms and suicidal ideation post-intervention (Christensen et al., 2016; Trockel, Karlin, Taylor, Brown, & Manber, 2015). However, interpretation of this evidence should be caveated by methodological limitations of both research studies. First, findings reported by Trockel et al. (2015) stemmed from an uncontrolled evaluation of CBT-I in a clinical sample, with no control group. Second, the randomised controlled trial conducted by Christensen and colleagues (2016) excluded people who met the diagnostic criteria for major depressive disorder, or who reported any recent suicidal plans or attempts.

For resolution of nightmare disorder in adults, there is a strong evidence base for the efficacy of Imagery Rehearsal Therapy (IRT), and for a pharmacological treatment called Prazosin (Aurora et al., 2010). In brief, during IRT sessions, patients are asked to recall the nightmare and then reimagine it but with less distressing content. The new content is then rehearsed multiple times, with the aim of shifting to the new dream narrative (Krakow et al., 2001). Findings from a small, open trial of 20 individuals on an inpatient psychiatric ward reported reduction in nightmares and suicidal ideation following administration of IRT (Ellis, Rufino, & Nadorff, 2017). Causal implications of this study are limited, given that this was an uncontrolled, case-series design trial. However, evidence from this study does indicate that it appears both safe and feasible to deliver IRT to people experiencing suicidal thoughts and behaviours. The reduction of nightmares or insomnia and improvement in the continuity and quality of sleep is also likely to benefit cognitive and physical resources, which subsequently will bolster the ability to engage in therapeutic interventions and the implementation of coping strategies.

7.4.3.2. Interventions targeted at related psychological factors.

As evidenced by the empirical chapters within this thesis, sleep disturbance does not have the same effect on everyone who experiences suicidal thoughts and behaviours. Therefore, it is likely that there are different pathways by which sleep may contribute to suicidal thoughts and behaviours. It would be prudent to provide interventions targeted at alleviating the impact of the psychological factors which may possibly drive the association between sleep disturbance and suicidal thoughts and behaviours. Targeting a reduction of entrapment is pertinent based on its posited role in triggering suicidal thoughts (Johnson et al., 2008; O'Connor, 2011; Williams, 1997; Williams et al., 2005), and the growing evidence base which has reported interrelationships between entrapment, suicidal thoughts and behaviours, and a range of symptoms of sleep disturbance, including nightmares, insomnia and poor sleep quality (Hochard, Heym, et al., 2017; Chapter 4; Littlewood, Gooding, Kyle, et al., 2016; Chapter 5; Littlewood, Gooding, Panagioti, et al., 2016; Chapter 3; Littlewood et al., 2017; Chapter 6; Littlewood et al., in press; Russell et al., in press). Central to entrapment is the notion that escape from one's current mental state is not possible. Therefore, clinicians could work with clients to counter perceptions of entrapment, by bolstering the individuals perceptions of their ability to cope and manage difficult situations (Tarrier et al., 2013; Taylor et al., 2011). For instance, through discussions with the client, it may be useful to identify previous times in which the individual has experienced a high sense of entrapment, and then re-establish the possible avenues to escape the emotionally defeating state. By incorporating these possible avenues into the client's formulation, this also has the potential to enhance the individuals sense of agency in managing their mental wellbeing (Johnstone, Whomsley, Cole, & Oliver, 2011). Based on the empirical evidence in this thesis, alleviating entrapment may be a key treatment target to reduce the impact of sleep disturbance on suicidal thoughts and behaviours.

7.5. Future research

Future research into understanding the relationship between sleep disturbance and suicidal thoughts and behaviours should focus on three aspects, i) further clarification of the role of entrapment, ii) investigation of mechanisms specific to the association between nightmares and suicidal thoughts and behaviours, and iii) the examination of the contribution of psychosocial factors.

7.5.1. Clarification of the role of entrapment.

Convergent evidence from this thesis, and the wider literature (Hochard, Heym, et al., 2017; Russell et al., in press), suggests that the association between symptoms of sleep disturbance and suicidal thoughts and behaviours, is only significant when the individual experiences entrapment (Chapters 4, 5, 6). Future research should progress from observational designs to investigate these interrelationships via experimental or intervention-based studies.

Prior to this, an alternative hypothesis should be considered, whereby findings could be interpreted as evidence of an underlying negative appraisal bias, as opposed to specifically stemming from entrapment. For instance, it is noteworthy that sleep quality was the only sleep parameter which significantly moderated the relationship between entrapment and suicidal ideation (Chapter 6; Littlewood et al., in press). Poor sleep quality is commonly self-reported across different types of sleep problems (Krakow, 2006). Assessment of sleep quality is thought to be based on numerous factors, such as feeling restored or refreshed on waking, number of night-time awakenings, and perceived total sleep duration (Harvey, Stinson, Whitaker, Moskovitz, & Virk, 2008; Ramlee et al., 2017). However, subjective sleep continuity and duration were not shown to moderate the association between pre-sleep entrapment and awakening suicidal ideation (Chapter 6; Littlewood et al., in press). Consequently, it is possible that this finding was driven by the extent to which people felt refreshed or restored on waking, rather than a specific

parameter of sleep. Thus, pointing to the possibility of a general cognitive bias towards negative appraisals.

The systematic review reported in Chapter 3, included evidence which had investigated five types of negative cognitive appraisal (hopelessness, defeat, entrapment, situational and self-appraisals)(Littlewood et al., 2017). These different types of appraisals all featured in the narratives of participants in the qualitative study (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016). Moreover, the extent to which defeat and entrapment can be considered discrete concepts has been debated in the wider literature (e.g., Forkmann, Teismann, Stenzel, Glaesmer, & De Beurs, 2018; Taylor, Wood, Gooding, Johnson, & Tarrier, 2009). Therefore, further research is needed to understand if this association between symptoms of sleep quality and suicidal ideation is specific to entrapment, or more a reflection of an underlying cognitive distortion producing a negative appraisal bias.

7.5.2. Mechanisms specific to the association between nightmares and suicidal thoughts and behaviours.

Nightmares are associated with suicidal thoughts, attempts (Sjostrom et al., 2009) and death by suicide (Tanskanen et al., 2001). Consequently, it is important to identify the mechanisms which account for this relationship. The cross-sectional study showed a significant indirect pathway between nightmares and suicidal behaviour, via defeat, entrapment and hopelessness, yet the direct pathway still remained significant (Chapter 5; Littlewood, Gooding, Panagioti, et al., 2016). Similarly, Russell and colleagues (in press) reported that the relationship between nightmares and suicidal ideation was partially accounted for by a three-step pathway from defeat, to entrapment. Together this provides convergent evidence to suggest that additional mechanism(s), beyond defeat, entrapment and hopelessness, account for the link between nightmares and suicidal thoughts and behaviours.

Further hypotheses can be identified from the model proposed in the systematic review (see Figure 3.2; Littlewood et al., 2017). Many of the mechanisms within the model may relate to core features of sleep disturbance, such as poor sleep quality and short sleep duration, both of which are likely to be present in those who experience nightmares (Krakow, 2006). However, evidence from the qualitative study reported in Chapter 4 indicated that there may be something quantitatively different about trauma-related nightmares, which relates to the differences in perception of sleep (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016). Specifically, those who did not experience nightmares believed that sleep could provide respite and an escape from distressing waking experiences. This belief was less relevant to those who experienced distressing and traumatic nightmares.

To further understanding of the pathways which may be specific to the association between nightmares and suicidal behaviour, an exploratory qualitative study could be conducted. In order to build on the qualitative study conducted in this thesis, it would be useful to compare beliefs about sleep and nightmares in relation to suicidal pathways amongst two different groups of people, those who have experienced trauma-related nightmares versus those who experienced non-trauma related nightmares.

A further avenue for research is the analysis of trauma-related dream content, in relation to suicidal thoughts and behaviours (Chapter 3; Littlewood et al., 2017). The association between dream content and self-harm was recently examined in a sample of university undergraduates. In this novel, 5-day diary study participants completed assessments of lifetime and current self-harm and provided written descriptions of nightmares or negative dream content on the morning after the dream occurred (Hochard, Ashcroft, Carroll, Heym, & Townsend, 2017). Analyses revealed no relationship between nightmare or negative dream content and subsequent acts of self-harm (Hochard, Ashcroft, et al., 2017). However, it should be noted that these findings were limited by the low incidence of reported self-harm which occurred following a nightmare or negative dream

($n = 8$). A similarly designed study conducted with people who experience trauma-related nightmares, may indicate the extent to which traumatic nightmares are associated with suicidal behaviour due to the reliving of the traumatic event which also reactivates negative emotions.

7.5.3. Contribution of psychosocial factors.

Additional research is needed to develop a fuller picture of the role of psychological factors in the association between sleep disturbance and suicidal thoughts and behaviours. The hypotheses outlined in the systematic review provided a clear starting point (see Figure 3.2; Littlewood et al., 2017). Primary focus should be given to quantifying the contributions of psychosocial factors, such as social isolation, perceived burdensomeness (e.g., belief that one is a burden to others) and thwarted belongingness (e.g., social isolation and disconnectedness). At the time of the systematic review, studies which had investigated interrelationships between psychosocial factors, sleep disturbance and suicidal thoughts and behaviours had yielded mixed results (Chu et al., 2016; Golding et al., 2015; Littlewood, Gooding, Kyle, et al., 2016; Nadorff, Anestis, et al., 2014). However, two recent papers published convergent findings from seven studies (six cross-sectional and one longitudinal design) which showed that the relationship between insomnia and suicidal ideation is mediated by thwarted belongingness (Chu et al., 2017; Hom et al., 2017). This supports evidence from the qualitative study whereby both nocturnal awakening and the daytime consequences of poor sleep were associated with social isolation. This was problematic given that social relationships and support was perceived to protect against suicidal thoughts and behaviours (Chapter 4; Littlewood, Gooding, Kyle, et al., 2016). Future research should seek to replicate findings from the single longitudinal study (Chu et al., 2017), by examining the temporal associations between insomnia, suicidal thoughts and behaviours, and thwarted belongingness. It will be important to vary the intervals between assessments of these factors to understand

whether this pathway operates in response to short-term changes in sleep, or if it is more relevant following periods of chronic sleep disturbance.

It is noteworthy, that the evidence regarding the role of psychosocial factors in relation to the association between nightmares and suicidal thoughts and acts, is mixed (Golding et al., 2015; Nadorff, Anestis, et al., 2014; Suh, Schneider, Lee, & Joiner, 2016). However, implications from these studies are limited to non-clinical samples. Therefore, investigation of the interrelationships between nightmares, psychosocial factors and suicidal thoughts and behaviours should be conducted within clinical samples. Such future research will clarify whether these identified psychosocial mechanisms are more relevant to symptoms of insomnia than nightmares.

7.6. Conclusion

In sum, this thesis provides novel insights on the relationship between sleep disturbance and suicidal thoughts and behaviours in four key areas. First, three pathways were identified to indicate how sleep is believed to contribute to suicidal thoughts and behaviours (Chapter 4). Second, short sleep duration and poor sleep quality were shown to predict severity of next-day suicidal ideation, but suicidal ideation did not predict symptoms of sleep disturbance the following night (Chapter 6). Third, preliminary evidence suggested that the association between nightmares and suicidal behaviour is not fully explained by defeat, entrapment, hopelessness and symptoms of insomnia (Chapter 5). Fourth, convergent qualitative (Chapter 4) and quantitative (Chapter 6) evidence showed that subjective sleep quality moderates the relationship between entrapment and suicidal ideation, whereby good sleep quality has the propensity to reduce awakening levels of suicidal ideation.

REFERENCES

- Agargun, M. Y., & Cartwright, R. (2003). REM sleep, dream variables and suicidality in depressed patients. *Psychiatry Research*, 119(1-2), 33-39.
[https://doi.org/10.1016/S0165-1781\(03\)00111-2](https://doi.org/10.1016/S0165-1781(03)00111-2)
- Agargun, M. Y., Kara, H., & Solmaz, M. (1997a). Sleep disturbances and suicidal behavior in patients with major depression. *The Journal of Clinical Psychiatry*, 58(6), 249-251. <http://dx.doi.org/10.4088/JCP.v58n0602>
- Agargun, M. Y., Kara, H., & Solmaz, M. (1997b). Subjective sleep quality and suicidality in patients with major depression. *Journal of Psychiatric Research*, 31(3), 377-381. [https://doi.org/10.1016/S0022-3956\(96\)00037-4](https://doi.org/10.1016/S0022-3956(96)00037-4)
- Allan, N. P., Conner, K. R., Pigeon, W. R., Gros, D. F., Salami, T. K., & Stecker, T. (2017). Insomnia and suicidal ideation and behaviors in former and current US service members: Does depression mediate the relations? *Psychiatry Research*, 252, 296-302. <https://doi.org/10.1016/j.psychres.2017.03.009>
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th edition). Washington DC: American Psychiatric Publishing.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th edition). Washington DC: American Psychiatric Publishing.
- Ancoli-Israel, S., Martin, J. L., Blackwell, T., Buenaver, L., Liu, L., Meltzer, L. J., . . . Taylor, D. J. (2015). The SBSM guide to actigraphy monitoring: clinical and research applications. *Behavioral Sleep Medicine*, 13(1)(Suppl.), S4-S38.
<https://doi.org/10.1080/15402002.2015.1046356>
- Aurora, R. N., Zak, R. S., Auerbach, S. H., Casey, K. R., Chowdhuri, S., Karippot, A., . . . Bista, S. R. (2010). Best practice guide for the treatment of nightmare disorder in adults. *Journal of Clinical Sleep Medicine*, 6(4), 389. Retrieved from
<http://jcsn.aasm.org/ViewAbstract.aspx?pid=27883>
- Baertschi, M., Costanza, A., Richard-Lepouriel, H., Pompili, M., Sarasin, F., Weber, K., & Canuto, A. (2017). The application of the interpersonal-psychological theory of suicide to a sample of Swiss patients attending a psychiatric emergency department for a non-lethal suicidal event. *Journal of Affective Disorders*, 210, 323-331.
<https://doi.org/10.1016/j.jad.2016.12.049>
- Baglioni, C., Battagliese, G., Feige, B., Spiegelhalder, K., Nissen, C., Voderholzer, U., . . . Riemann, D. (2011). Insomnia as a predictor of depression: a meta-analytic evaluation of longitudinal epidemiological studies. *Journal of Affective Disorders*, 135(1), 10-19. <https://doi.org/10.1016/j.jad.2011.01.011>
- Baglioni, C., Nanovska, S., Regen, W., Spiegelhalder, K., Feige, B., Nissen, C., . . . Riemann, D. (2016). Sleep and mental disorders: A meta-analysis of polysomnographic research. *Psychological Bulletin*, 142(9), 969.
<http://dx.doi.org/10.1037/bul0000053>
- Baglioni, C., Spiegelhalder, K., Nissen, C., & Riemann, D. (2011). Clinical implications of the causal relationship between insomnia and depression: how individually tailored treatment of sleeping difficulties could prevent the onset of depression. *EPMA Journal*, 2(3), 287-293. <https://doi.org/10.1007/s13167-011-0079-9>
- Bahk, Y.-C., Han, E., & Lee, S.-H. (2014). Biological rhythm differences and suicidal ideation in patients with major depressive disorder. *Journal of Affective Disorders*, 168, 294-297. <https://doi.org/10.1016/j.jad.2014.07.001>
- Ballard, E. D., Vande Voort, J. L., Bernert, R. A., Luckenbaugh, D. A., Richards, E. M., Niciu, M. J., . . . Zarate, C. A., Jr. (2016). Nocturnal Wakefulness Is Associated With Next-Day Suicidal Ideation in Major Depressive Disorder and Bipolar Disorder. *The Journal of Clinical Psychiatry*, 77(6), 825-831.
<https://doi.org/10.4088/JCP.15m09943>

- Batterham, P. J., Ftanou, M., Pirkis, J., Brewer, J. L., Mackinnon, A. J., Beautrais, A., . . . Christensen, H. (2015). A systematic review and evaluation of measures for suicidal ideation and behaviors in population-based research. *Psychological Assessment*, 27(2), 501-512. <https://doi:10.1037/pas0000053>
- Baumeister, R. F. (1990). Suicide as escape from self. *Psychological Review*, 97(1), 90-113. <http://psycnet.apa.org/doi/10.1037/0033-295X.97.1.90>
- Beattie, L., Kyle, S. D., Espie, C. A., & Biello, S. M. (2015). Social interactions, emotion and sleep: A systematic review and research agenda. *Sleep Medicine Reviews*, 24, 83-100. <https://doi:10.1016/j.smr.2014.12.005>
- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for beck depression inventory-II*. San Antonio, TX: Psychological Corporation.
- Beck, A. T., Steer, R. A., & Ranieri, W. F. (1988). Scale for suicide ideation: Psychometric properties of a self-report version. *Journal of Clinical Psychology*, 44(4), 499-505. [https://doi.org/10.1002/1097-4679\(198807\)44:4<499::AID-JCLP2270440404>3.0.CO;2-6](https://doi.org/10.1002/1097-4679(198807)44:4<499::AID-JCLP2270440404>3.0.CO;2-6)
- Beck, A. T., Weissman, A., Lester, D., & Trexler, L. (1974). The measurement of pessimism: the hopelessness scale. *Journal of Consulting and Clinical Psychology*, 42(6), 861. <http://psycnet.apa.org/doi/10.1037/h0037562>
- Ben-Zeev, D., Young, M. A., & Depp, C. A. (2012). Real-time predictors of suicidal ideation: mobile assessment of hospitalized depressed patients. *Psychiatry Research*, 197(1-2), 55-59. <https://doi:10.1016/j.psychres.2011.11.025>
- Berking, M., & Wupperman, P. (2012). Emotion regulation and mental health: recent findings, current challenges, and future directions. *Current Opinion in Psychiatry*, 25(2), 128-134. <https://doi:10.1097/YCO.0b013e3283503669>
- Berman, A. L. (2017). Risk factors proximate to suicide and suicide risk assessment in the context of denied suicide ideation. *Suicide and Life-threatening Behavior*. <https://doi.org/10.1111/sltb.12351>
- Bernal, M., Haro, J. M., Bernert, S., Brugha, T., de Graaf, R., Bruffaerts, R. e., . . . Gasquet, I. (2007). Risk factors for suicidality in Europe: results from the ESEMED study. *Journal of Affective Disorders*, 101(1), 27-34. <https://doi.org/10.1016/j.jad.2006.09.018>
- Bernert, R. A., & Joiner, T. E. (2007). Sleep disturbances and suicide risk: A review of the literature. *Neuropsychiatric Disease and Treatment*, 3(6), 735-743. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2656315/>
- Bernert, R. A., Joiner Jr, T. E., Cukrowicz, K. C., Schmidt, N. B., & Krakow, B. (2005). Suicidality and sleep disturbances. *Sleep*, 28(9), 1135-1141. <https://doi.org/10.1093/sleep/28.9.1135>
- Bernert, R. A., Kim, J. S., Iwata, N. G., & Perlis, M. L. (2015). Sleep disturbances as an evidence-based suicide risk factor. *Current Psychiatry Reports*, 17(3), 554. doi:10.1007/s11920-015-0554-4
- Bernert, R. A., Luckenbaugh, D. A., Duncan, W. C., Iwata, N. G., Ballard, E. D., & Zarate, C. A. (2017). Sleep architecture parameters as a putative biomarker of suicidal ideation in treatment-resistant depression. *Journal of Affective Disorders*, 208, 309-315. <https://doi:10.1016/j.jad.2016.08.050>
- Bernert, R. A., & Nadorff, M. R. (2015). Sleep Disturbances and Suicide Risk. *Sleep Medicine Clinics*, 10(1), 35-39. <https://doi:10.1016/j.jsmc.2014.11.004>
- Bernert, R. A., Turvey, C. L., Conwell, Y., & Joiner, T. E., Jr. (2014). Association of poor subjective sleep quality with risk for death by suicide during a 10-year period: A longitudinal, population-based study of late life. *JAMA Psychiatry*, 71(10), 1129-1137. <https://doi:10.1001/jamapsychiatry.2014.1126>
- Biddle, L., Cooper, J., Owen-Smith, A., Klineberg, E., Bennewith, O., Hawton, K., . . . Gunnell, D. (2013). Qualitative interviewing with vulnerable populations: individuals' experiences of participating in suicide and self-harm based research.

Journal of Affective Disorders, 145(3), 356-362.

<https://doi.org/10.1016/j.jad.2012.08.024>

Blake, D. D., Weathers, F. W., Nagy, L. M., Kaloupek, D. G., Gusman, F. D., Charney, D. S., & Keane, T. M. (1995). The development of a clinician-administered PTSD scale. *Journal of Traumatic Stress*, 8(1), 75-90.

<https://doi.org/10.1007/BF02105408>

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. Chichester: Wiley.

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development*. Thousand Oaks, CA: Sage Publications

Braam, A. W., Copeland, J. R., Delespaul, P. A., Beekman, A. T., Como, A., Dewey, M., . . . Lobo, A. (2014). Depression, subthreshold depression and comorbid anxiety symptoms in older Europeans: results from the EURODEP concerted action.

Journal of Affective Disorders, 155, 266-272.

<https://doi.org/10.1016/j.jad.2013.11.011>

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. [https:// DOI: 10.1191/1478088706qp0630a](https://doi.org/10.1191/1478088706qp0630a)

Brent, D., Melhem, N., Donohoe, M. B., & Walker, M. (2009). The incidence and course of depression in bereaved youth 21 months after the loss of a parent to suicide, accident, or sudden natural death. *American Journal of Psychiatry*, 166(7), 786-794. <https://doi.org/10.1176/appi.ajp.2009.08081244>

Brezo, J., Paris, J., & Turecki, G. (2006). Personality traits as correlates of suicidal ideation, suicide attempts, and suicide completions: a systematic review. *Acta Psychiatrica Scandinavica*, 113(3), 180-206. <https://doi.org/10.1111/j.1600-0447.2005.00702.x>

Britten, N. (1995). Qualitative research: qualitative interviews in medical research. *Bmj*, 311(6999), 251-253. <https://doi.org/10.1136/bmj.311.6999.251>

Brown, G. K. (2001). *A review of suicide assessment measures for intervention research with adults and older adults*. Retrieved from https://www.researchgate.net/profile/David_Jobes3/publication/229054594_A_review_of_suicide_assessment_measures_for_intervention_research_with_adults_and_older_adults/links/00b7d51f30a018fb96000000.pdf

Brown, G. K., Beck, A. T., Steer, R. A., & Grisham, J. R. (2000). Risk factors for suicide in psychiatric outpatients: a 20-year prospective study. *Journal of Consulting and Clinical Psychology*, 68(3), 371. [https://DOI:10.1037//0022-006X.68.3.371](https://doi.org/10.1037//0022-006X.68.3.371)

Brown, T. A., Campbell, L. A., Lehman, C. L., Grisham, J. R., & Mancill, R. B. (2001). Current and lifetime comorbidity of the DSM-IV anxiety and mood disorders in a large clinical sample. *Journal of Abnormal Psychology*, 110(4), 585. [https://DOI:10.1037//0021-843X.110.4.585](https://doi.org/10.1037//0021-843X.110.4.585)

Bryan, C. J., Gonzales, J., Rudd, M. D., Bryan, A. O., Clemans, T. A., Ray-Sannerud, B., . . . Etienne, N. (2015). Depression mediates the relation of insomnia severity with suicide risk in three clinical samples of U.S. military personnel. *Depression and Anxiety*, 32(9), 647-655. <https://doi.org/10.1002/da.22383>

Butler, A. M., & Malone, K. (2013). Attempted suicide v. non-suicidal self-injury: behaviour, syndrome or diagnosis? *The British Journal of Psychiatry*, 202, 324-325. [https:// doi: 10.1192/bjp.bp.112.113506](https://doi.org/10.1192/bjp.bp.112.113506)

Buyse, D. J. (2014). Sleep health: can we define it? Does it matter? *Sleep*, 37(1), 9-17. <https://doi.org/10.5665/sleep.3298>

Buyse, D. J., Ancoli-Israel, S., Edinger, J. D., Lichstein, K. L., & Morin, C. M. (2006). Recommendations for a standard research assessment of insomnia. *Sleep*, 29(9), 1155-1173. <https://doi.org/10.1093/sleep/29.9.1155>

Buyse, D. J., Reynolds, C. F., 3rd, Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and

- research. *Psychiatry Research*, 28(2), 193-213. [https://doi.org/10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4)
- Cappuccio, F. P., D'elia, L., Strazzullo, P., & Miller, M. A. (2010). Quantity and quality of sleep and incidence of type 2 diabetes: a systematic review and meta-analysis. *Diabetes Care*, 33(2), 414-420. <https://doi.org/10.2337/dc09-1124>
- Cappuccio, F. P., Taggart, F. M., Kandala, N.-B., Currie, A., Peile, E., Stranges, S., & Miller, M. A. (2008). Meta-analysis of short sleep duration and obesity in children and adults. *Sleep*, 31(5), 619-626. <https://doi.org/10.1093/sleep/31.5.619>
- Carney, C. E., Buysse, D. J., Ancoli-Israel, S., Edinger, J. D., Krystal, A. D., Lichstein, K. L., & Morin, C. M. (2012). The consensus sleep diary: standardizing prospective sleep self-monitoring. *Sleep*, 35(2), 287-302. <https://doi.org/10.5665/sleep.1642>
- Carter, L. A. (2016). *Rigorous methods for the analysis, reporting and evaluation of ESM style data*. University of Manchester.
- Casement, M. D., & Swanson, L. M. (2012). A meta-analysis of imagery rehearsal for post-trauma nightmares: effects on nightmare frequency, sleep quality, and posttraumatic stress. *Clinical Psychology Review*, 32(6), 566-574. <https://doi.org/10.1016/j.cpr.2012.06.002>
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychological Medicine*, 33(3), 395-405. <https://doi.org/10.1017/S0033291702006943>
- Centers for Disease Control and Prevention. (2017). Web-based injury statistics query and reporting system (WISQARS). Retrieved from <https://webappa.cdc.gov/sasweb/ncipc/mortrate.html>
- Chakravorty, S., Grandner, M. A., Mavandadi, S., Perlis, M. L., Sturgis, E. B., & Oslin, D. W. (2014). Suicidal ideation in veterans misusing alcohol: Relationships with insomnia symptoms and sleep duration. *Addictive Behaviors*, 39(2), 399-405. <https://doi.org/10.1016/j.addbeh.2013.09.022>
- Chan, J. W. Y., Lam, S. P., Li, S. X., Yu, M. W. M., Chan, N. Y., Zhang, J. i., & Wing, Y. K. (2014). Eveningness and insomnia: independent risk factors of nonremission in major depressive disorder. *Sleep*, 37(5), 911-917. <https://doi.org/10.5665/sleep.3658>
- Chang, S.-S., Stuckler, D., Yip, P., & Gunnell, D. (2013). Impact of 2008 global economic crisis on suicide: time trend study in 54 countries. *Bmj*, 347, f5239. <https://doi.org/10.1136/bmj.f5239>
- Cheng, H. G., & Phillips, M. R. (2014). Secondary analysis of existing data: opportunities and implementation. *Shanghai Archives of Psychiatry*, 26(6), 371. <https://doi.org/10.11919%2Fj.issn.1002-0829.214171>
- Chesney, E., Goodwin, G. M., & Fazel, S. (2014). Risks of all-cause and suicide mortality in mental disorders: a meta-review. *World Psychiatry*, 13(2), 153-160. <https://doi.org/10.1002/wps.20128>
- Cho, H. J., Lavretsky, H., Olmstead, R., Levin, M. J., Oxman, M. N., & Irwin, M. R. (2008). Sleep disturbance and depression recurrence in community-dwelling older adults: a prospective study. *American Journal of Psychiatry*, 165(12), 1543-1550. <https://doi.org/10.1176/appi.ajp.2008.07121882>
- Christensen, H., Batterham, P. J., Gosling, J. A., Ritterband, L. M., Griffiths, K. M., Thorndike, F. P., . . . Mackinnon, A. J. (2016). Effectiveness of an online insomnia program (SHUTi) for prevention of depressive episodes (the GoodNight Study): a randomised controlled trial. *The Lancet Psychiatry*, 3(4), 333-341. [https://doi.org/10.1016/S2215-0366\(15\)00536-2](https://doi.org/10.1016/S2215-0366(15)00536-2)
- Chu, C., Hom, M. A., Rogers, M. L., Ringer, F. B., Hames, J. L., Suh, S., & Joiner, T. E. (2016). Is insomnia lonely? Exploring thwarted belongingness as an explanatory link between insomnia and suicidal ideation in a sample of South Korean university students. *Journal of Clinical Sleep Medicine*, 12(5), 647. <https://doi.org/10.5664/jcsm.5784>

- Chu, C., Hom, M. A., Rogers, M. L., Stanley, I. H., Ringer-Moberg, F. B., Podlogar, M. C., . . . Joiner, T. E. (2017). Insomnia and suicide-related behaviors: A multi-study investigation of thwarted belongingness as a distinct explanatory factor. *Journal of Affective Disorders*, 208, 153-162. <https://doi.org/10.1016/j.jad.2016.08.065>
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*. (4th edition). Thousand Oaks, CA: SAGE Publications
- Cukrowicz, K. C., Otamendi, A., Pinto, J. V., Bernert, R. A., Krakow, B., & Joiner, T. E., Jr. (2006). The impact of insomnia and sleep disturbances on depression and suicidality. *Dreaming*, 16(1), 1-10. <https://DOI:10.1037/1053-0797.16.1.1>
- Davidson, C. L., Anestis, M. D., & Gutierrez, P. M. (2017). Ecological momentary assessment is a neglected methodology in suicidology. *Archives of Suicide Research*, 21(1), 1-11. <https://doi.org/10.1080/13811118.2015.1004482>
- Dazzi, T., Gribble, R., Wessely, S., & Fear, N. T. (2014). Does asking about suicide and related behaviours induce suicidal ideation? What is the evidence? *Psychological Medicine*, 44(16), 3361-3363. <https://doi.org/10.1017/S0033291714001299>
- Dhingra, K., Boduszek, D., & O'Connor, R. C. (2015). Differentiating suicide attempters from suicide ideators using the Integrated Motivational-Volitional model of suicidal behaviour. *Journal of Affective Disorders*, 186, 211-218. <https://doi.org/10.1016/j.jad.2015.07.007>
- Dolsen, M. R., Asarnow, L. D., & Harvey, A. G. (2014). Insomnia as a transdiagnostic process in psychiatric disorders. *Current Psychiatry Reports*, 16(9), 471. <https://doi.org/10.1007/s11920-014-0471-y>
- Domecq, J. P., Prutsky, G., Elraiyah, T., Wang, Z., Nabhan, M., Shippee, N., . . . Firwana, B. (2014). Patient engagement in research: a systematic review. *BMC Health Services Research*, 14(1), 89. <https://doi.org/10.1186/1472-6963-14-89>
- Doody, O., & Noonan, M. (2013). Preparing and conducting interviews to collect data. *Nurse Research*, 20(5), 28-32. <http://dx.doi.org/10.7748/nr2013.05.20.5.28.e327>
- Efron, B., & Tibshirani, R. J. (1993). *An Introduction to the Bootstrap*. London: Chapman & Hall.
- Ehlers, C. L., Frank, E., & Kupfer, D. J. (1988). Social zeitgebers and biological rhythms: a unified approach to understanding the etiology of depression. *Archives of General Psychiatry*, 45(10), 948-952. [doi:10.1001/archpsyc.1988.01800340076012](https://doi.org/10.1001/archpsyc.1988.01800340076012)
- Ehlers, C. L., Kupfer, D. J., Frank, E., & Monk, T. H. (1993). Biological rhythms and depression: the role of zeitgebers and zeitstorsers. *Depression*, 1(6), 285-293. <https://doi.org/10.1002/depr.3050010602>
- Ellis, T. E., Rufino, K. A., & Nadorff, M. R. (2017). Treatment of Nightmares in Psychiatric Inpatients With Imagery Rehearsal Therapy: An Open Trial and Case Series. *Behavioral Sleep Medicine*, 1-14. [doi:10.1080/15402002.2017.1299738](https://doi.org/10.1080/15402002.2017.1299738)
- Espie, C. A., Kyle, S. D., Hames, P., Gardani, M., Fleming, L., & Cape, J. (2014). The Sleep Condition Indicator: a clinical screening tool to evaluate insomnia disorder. *BMJ Open*, 4(3), e004183. <http://dx.doi.org/10.1136/bmjopen-2013-004183>
- Fabbian, F., Zucchi, B., De Giorgi, A., Tiseo, R., Boari, B., Salmi, R., . . . Signani, F. (2016). Chronotype, gender and general health. *Chronobiology International*, 33(7), 863-882. <https://doi.org/10.1080/07420528.2016.1176927>
- Fairholme, C. P., Nosen, E. L., Nillni, Y. I., Schumacher, J. A., Tull, M. T., & Coffey, S. F. (2013). Sleep disturbance and emotion dysregulation as transdiagnostic processes in a comorbid sample. *Behaviour Research and Therapy*, 51(9), 540-546. <https://doi.org/10.1016/j.brat.2013.05.014>
- Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods*, 5(1), 80-92. <https://doi.org/10.1177/160940690600500107>

- Ferentinos, P., Porichi, E., Christodoulou, C., Dikeos, D., Papageorgiou, C., & Douzenis, A. (2016). *Sleep Medicine*, 19, 1-7. <https://doi.org/10.1016/j.sleep.2015.10.021>
- Field, A. (2013). *Discovering Statistics Using IBM SPSS Statistics*. (4th edition). London: SAGE Publications.
- Fine, T. H., Contractor, A. A., Tamburrino, M., Elhai, J. D., Prescott, M. R., Cohen, G. H., . . . Calabrese, J. R. (2013). Validation of the telephone-administered PHQ-9 against the in-person administered SCID-I major depression module. *Journal of Affective Disorders*, 150(3), 1001-1007. <https://doi.org/10.1016/j.jad.2013.05.029>
- First, M., Spitzer, R., Gibbon, M., & Williams, J. B. (1997). *Structured clinical interview for DSM-IV clinical version (SCID-I/CV)*. Washington, DC: American Psychiatric Press.
- Forkmann, T., Teismann, T., Stenzel, J.-S., Glaesmer, H., & De Beurs, D. (2018). Defeat and entrapment: more than meets the eye? Applying network analysis to estimate dimensions of highly correlated constructs. *BMC Medical Research Methodology*, 18(1), 16. <https://doi.org/10.1186/s12874-018-0470-5>
- Fortier-Brochu, É., Beaulieu-Bonneau, S., Ivers, H., & Morin, C. M. (2012). Insomnia and daytime cognitive performance: a meta-analysis. *Sleep Medicine Reviews*, 16(1), 83-94. <https://doi.org/10.1016/j.smrv.2011.03.008>
- Franklin, J. C., Ribeiro, J. D., Fox, K. R., Bentley, K. H., Kleiman, E. M., Huang, X., . . . Nock, M. K. (2017). Risk factors for suicidal thoughts and behaviors: A meta-analysis of 50 years of research. *Psychological Bulletin*, 143(2), 187-232. doi:10.1037/bul0000084
- Franzen, P. L., & Buysse, D. J. (2008). Sleep disturbances and depression: Risk relationships for subsequent depression and therapeutic implications. *Dialogues in Clinical Neuroscience*, 10(4), 473-481. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3108260/>
- Frith, H., & Gleeson, K. (2011). Qualitative data collection: Asking the right questions. In D. Harper & A. R. Thompson (Eds.), *Qualitative research methods in mental health and psychotherapy: A guide for students and practitioners* (pp. 55-68). Chichester: Wiley.
- Gelaye, B., Addae, G., Neway, B., Larrabure-Torrealva, G. T., Qiu, C., Stoner, L., . . . Williams, M. A. (2017). Poor sleep quality, antepartum depression and suicidal ideation among pregnant women. *Journal of Affective Disorders*, 209, 195-200. <https://doi.org/10.1016/j.jad.2016.11.020>
- Gibson, S., Boden, Z. V., Benson, O., & Brand, S. L. (2014). The impact of participating in suicide research online. *Suicide and Life-threatening Behavior*, 44(4), 372-383. <https://doi.org/10.1111/sltb.12082>
- Gilbert, P., & Allan, S. (1998). The role of defeat and entrapment (arrested flight) in depression: an exploration of an evolutionary view. *Psychological Medicine*, 28(3), 585-598. Retrieved from <https://www.cambridge.org/core/journals/psychological-medicine/article/role-of-defeat-and-entrapment-arrested-flight-in-depression-an-exploration-of-an-evolutionary-view/A28C75514B33418F797269B1C276AC87>
- Ginzburg, K., Ein-Dor, T., & Solomon, Z. (2010). Comorbidity of posttraumatic stress disorder, anxiety and depression: a 20-year longitudinal study of war veterans. *Journal of Affective Disorders*, 123(1), 249-257. <https://doi.org/10.1016/j.jad.2009.08.006>
- Glaser, B. G., & Strauss, A. L. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago, IL: Aldine.
- Golding, S., Nadorff, M. R., Winer, E. S., & Ward, K. C. (2015). Unpacking sleep and suicide in older adults in a combined online sample. *Journal of Clinical Sleep Medicine*, 11(12), 1385-1392. <https://doi.org/10.5664/jcsm.5270>
- Goldstein, A. N., & Walker, M. P. (2014). The role of sleep in emotional brain function. *Annual Review of Clinical Psychology*, 10, 679-708. <https://doi.org/10.1146/annurev-clinpsy-032813-153716>

- Goodwin, R. D., & Marusic, A. (2008). Association between short sleep and suicidal ideation and suicide attempt among adults in the general population. *Sleep*, 31(8), 1097-1101. <https://doi.org/10.5665/sleep/31.8.1097>
- Gotlib, I. H., & Joormann, J. (2010). Cognition and depression: current status and future directions. *Annual Review of Clinical Psychology*, 6, 285-312. <https://doi.org/10.1146/annurev.clinpsy.121208.131305>
- Greene, J. C., & Caracelli, V. J. (1997). Defining and describing the paradigm issue in mixed-method evaluation. *New Directions for Evaluation*, 1997(74), 5-17. <https://doi.org/10.1002/ev.1068>
- Gunnell, D., Chang, S. S., Tsai, M. K., Tsao, C. K., & Wen, C. P. (2013). Sleep and suicide: an analysis of a cohort of 394,000 Taiwanese adults. *Social Psychiatry and Psychiatric Epidemiology*, 48(9), 1457-1465. <https://doi.org/10.1007/s00127-013-0675-1>
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *The British Journal of Psychiatry*, 170(3), 205-228. <https://doi.org/10.1192/bjp.170.3.205>
- Harvey, A. G., Murray, G., Chandler, R. A., & Soehner, A. (2011). Sleep disturbance as transdiagnostic: consideration of neurobiological mechanisms. *Clinical Psychology Review*, 31(2), 225-235. <https://doi.org/10.1016/j.cpr.2010.04.003>
- Harvey, A. G., Stinson, K., Whitaker, K. L., Moskowitz, D., & Virk, H. (2008). The subjective meaning of sleep quality: a comparison of individuals with and without insomnia. *Sleep*, 31(3), 383-393. <https://doi.org/10.1093/sleep/31.3.383>
- Hasler, B. P., & Germain, A. (2009). Correlates and treatments of nightmares in adults. *Sleep medicine clinics*, 4(4), 507-517. <https://doi.org/10.1016/j.jsmc.2009.07.012>
- Hassan, E. (2006). Recall bias can be a threat to retrospective and prospective research designs. *The Internet Journal of Epidemiology*, 3(2), 339-412. Retrieved from <http://ispub.com/IJE/3/2/13060>
- Hawton, K., Bergen, H., Casey, D., Simkin, S., Palmer, B., Cooper, J., . . . Lilley, R. (2007). Self-harm in England: a tale of three cities. *Social Psychiatry and Psychiatric Epidemiology*, 42(7), 513-521. <https://doi.org/10.1007/s00127-007-0199-7>
- Hawton, K., Cole, D., O'Grady, J., & Osborn, M. (1982). Motivational aspects of deliberate self-poisoning in adolescents. *The British Journal of Psychiatry*, 141(3), 286-291. <https://doi.org/10.1192/bjp.141.3.286>
- Hawton, K., Comabella, C. C., Haw, C., & Saunders, K. (2013). Risk factors for suicide in individuals with depression: a systematic review. *Journal of Affective Disorders*, 147(1), 17-28. <https://doi.org/10.1016/j.jad.2013.01.004>
- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: Guilford Publications.
- Heelis, R., Graham, H., & Jackson, C. (2016). A Preliminary Test of the Interpersonal Psychological Theory of Suicidal Behavior in Young People With a First Episode of Psychosis. *Journal of Clinical Psychology*, 72(1), 79-87. doi:10.1002/jclp.22233
- Henwood, K. L., & Pidgeon, N. F. (1992). Qualitative research and psychological theorizing. *British Journal of Psychology*, 83(1), 97-111. doi:10.1111/j.2044-8295.1992.tb02426.x
- Herzog, R., Álvarez-Pasquin, M. J., Díaz, C., Del Barrio, J. L., Estrada, J. M., & Gil, Á. (2013). Are healthcare workers' intentions to vaccinate related to their knowledge, beliefs and attitudes? A systematic review. *BMC Public Health*, 13(1), 154. <https://doi.org/10.1186/1471-2458-13-154>
- Heyvaert, M., Hannes, K., Maes, B., & Onghena, P. (2013). Critical appraisal of mixed methods studies. *Journal of Mixed Methods Research*, 7(4), 302-327. <https://doi.org/10.1177/1558689813479449>

- Hjelmeland, H., Dieserud, G., Dyregrov, K., Knizek, B. L., & Leenaars, A. A. (2012). Psychological autopsy studies as diagnostic tools: are they methodologically flawed? *Death Studies*, 36(7), 605-626.
<https://doi.org/10.1080/07481187.2011.584015>
- Hjelmeland, H., & Knizek, B. L. (2010). Why we need qualitative research in suicidology. *Suicide and Life-threatening Behavior*, 40(1), 74-80.
<https://doi.org/10.1521/suli.2010.40.1.74>
- Hjelmeland, H., & Knizek, B. L. (2016). Time to change direction in suicide research. In R. C. O'Connor & J. Pirkis (Eds.), *The international handbook of suicide prevention* (pp. 696-709). Chichester: Wiley.
- Hochard, K. D., Ashcroft, S., Carroll, J., Heym, N., & Townsend, E. (2017). Exploring Thematic Nightmare Content and Associated Self-Harm Risk. *Suicide and Life-threatening Behavior*. doi:10.1111/sltb.12402
- Hochard, K. D., Heym, N., & Townsend, E. (2017). Investigating the Interaction Between Sleep Symptoms of Arousal and Acquired Capability in Predicting Suicidality. *Suicide and Life-threatening Behavior*, 47(3), 370-381. doi:10.1111/sltb.12285
- Holloway, I., & Todres, L. (2003). The status of method: flexibility, consistency and coherence. *Qualitative Research*, 3(3), 345-357.
<https://doi.org/10.1177/1468794103033004>
- Hom, M. A., Chu, C., Schneider, M. E., Lim, I. C., Hirsch, J. K., Gutierrez, P. M., & Joiner, T. E. (2017). Thwarted belongingness as an explanatory link between insomnia symptoms and suicidal ideation: Findings from three samples of military service members and veterans. *Journal of Affective Disorders*, 209, 114-123.
<https://doi.org/10.1016/j.jad.2016.11.032>
- Hom, M. A., Lim, I. C., Stanley, I. H., Chiurliza, B., Podlogar, M. C., Michaels, M. S., . . . Joiner, T. E. (2016). Insomnia brings soldiers into mental health treatment, predicts treatment engagement, and outperforms other suicide-related symptoms as a predictor of major depressive episodes. *Journal of Psychiatric Research*, 79, 108-115. <http://dx.doi.org/10.1016/j.jpsychires.2016.05.008>
- Hublin, C., Kaprio, J., Partinen, M., & Koskenvuo, M. (1999). Nightmares: familial aggregation and association with psychiatric disorders in a nationwide twin cohort. *American Journal of Medical Genetics Part A*, 88(4), 329-336.
[https://doi.org/10.1002/\(SICI\)1096-8628\(19990820\)88:4%3C329::AID-AJMG8%3E3.0.CO;2-E](https://doi.org/10.1002/(SICI)1096-8628(19990820)88:4%3C329::AID-AJMG8%3E3.0.CO;2-E)
- Husky, M., Olié, E., Guillaume, S., Genty, C., Swendsen, J., & Courtet, P. (2014). Feasibility and validity of ecological momentary assessment in the investigation of suicide risk. *Psychiatry Research*, 220(1), 564-570.
<https://doi.org/10.1016/j.psychres.2014.08.019>
- Ikehara, S., Iso, H., Date, C., Kikuchi, S., Watanabe, Y., Wada, Y., . . . Group, J. S. (2009). Association of sleep duration with mortality from cardiovascular disease and other causes for Japanese men and women: the JACC study. *Sleep*, 32(3), 295-301. <https://doi.org/10.1093/sleep/32.3.295>
- Johnson, J., Gooding, P., & Tarrier, N. (2008). Suicide risk in schizophrenia: explanatory models and clinical implications, The Schematic Appraisal Model of Suicide (SAMS). *Psychology and Psychotherapy: Theory, Research and Practice*, 81(Pt 1), 55-77. doi:10.1348/147608307X244996
- Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research*, 1(2), 112-133.
<https://doi.org/10.1177/1558689806298224>
- Johnstone, L., Whomsley, S., Cole, S., & Oliver, N. (2011). *Good practice guidelines on the use of psychological formulation*. Leicester: British Psychological Society.
- Joiner, T. E. (2005). *Why people die by suicide*. Cambridge, MA: Harvard University Press.

- Kahn, M., Sheppes, G., & Sadeh, A. (2013). Sleep and emotions: bidirectional links and underlying mechanisms. *International Journal of Psychophysiology*, 89(2), 218-228. <https://doi.org/10.1016/j.ijpsycho.2013.05.010>
- Kaplan, M. L., Asnis, G. M., Sanderson, W. C., Keswani, L., de Lecuona, J. M., & Joseph, S. (1994). Suicide assessment: clinical interview vs. self-report. *Journal of Clinical Psychology*, 50(2), 294-298. [https://doi.org/10.1002/1097-4679\(199403\)50:2%3C294::AID-JCLP2270500224%3E3.0.CO;2-R](https://doi.org/10.1002/1097-4679(199403)50:2%3C294::AID-JCLP2270500224%3E3.0.CO;2-R)
- Kapur, N., Cooper, J., O'Connor, R. C., & Hawton, K. (2013). Non-suicidal self-injury v. attempted suicide: new diagnosis or false dichotomy? *The British Journal of Psychiatry*, 202, 326-328. <https://doi.org/10.1192/bjp.bp.112.116111>
- Keshavan, M. S., Reynolds, C. F., Montrose, D., Miewald, J., Downs, C., & Sabo, E. M. (1994). Sleep and suicidality in psychotic patients. *Acta Psychiatrica Scandinavica*, 89(2), 122-125. <https://doi.org/10.1111/j.1600-0447.1994.tb01498.x>
- Kleiman, E. M., Turner, B. J., Fedor, S., Beale, E. E., Huffman, J. C., & Nock, M. K. (2017). Examination of real-time fluctuations in suicidal ideation and its risk factors: Results from two ecological momentary assessment studies. *Journal of Abnormal Psychology*, 126(6), 726-738. doi:10.1037/abn0000273
- Klonsky, E. D., & May, A. M. (2015). The three-step theory (3ST): A new theory of suicide rooted in the "ideation-to-action" framework. *International Journal of Cognitive Therapy*, 8(2), 114-129. <https://doi.org/10.1521/ijct.2015.8.2.114>
- Knox, S., & Burkard, A. W. (2009). Qualitative research interviews. *Psychotherapy Research*, 19(4-5), 566-575. <https://doi.org/10.1080/10503300802702105>
- Krakow, B. (2006). Nightmare complaints in treatment-seeking patients in clinical sleep medicine settings: diagnostic and treatment implications. *Sleep*, 29(10), 1313-1319. <https://doi.org/10.1093/sleep/29.10.1313>
- Krakow, B., Hollifield, M., Johnston, L., Koss, M., Schrader, R., Warner, T. D., . . . Cutchen, L. (2001). Imagery rehearsal therapy for chronic nightmares in sexual assault survivors with posttraumatic stress disorder: a randomized controlled trial. *JAMA*, 286(5), 537-545. doi:10.1001/jama.286.5.537
- Krakow, B., Ribeiro, J. D., Ulibarri, V. A., Krakow, J., & Joiner, T. E., Jr. (2011). Sleep disturbances and suicidal ideation in sleep medical center patients. *Journal of Affective Disorders*, 131(1-3), 422-427. <https://doi.org/10.1016/j.jad.2010.12.001>
- Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The phq-9. *Journal of General Internal Medicine*, 16(9), 606-613. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>
- Lai, Y. C., Huang, M. C., Chen, H. C., Lu, M. K., Chiu, Y. H., Shen, W. W., . . . Kuo, P. H. (2014). Familiality and clinical outcomes of sleep disturbances in major depressive and bipolar disorders. *Journal of Psychosomatic Research*, 76(1), 61-67. <https://doi.org/10.1016/j.jpsychores.2013.10.020>
- Lakeman, R., & Fitzgerald, M. (2009a). Ethical suicide research: a survey of researchers. *International Journal of Mental Health Nursing*, 18(1), 10-17. doi:10.1111/j.1447-0349.2008.00569.x
- Lakeman, R., & Fitzgerald, M. (2009b). The ethics of suicide research. *Crisis*, 30(1), 13-19. doi:10.1027/0227-5910.30.1.13
- Lapierre, S., Boyer, R., Desjardins, S., Dube, M., Lorrain, D., Preville, M., & Brassard, J. (2012). Daily hassles, physical illness, and sleep problems in older adults with wishes to die. *International Psychogeriatrics*, 24(2), 243-252. <https://doi.org/10.1017/S1041610211001591>
- Larson, R., & Csikszentmihalyi, M. (1983). The experience sampling method. In H. T. Reis (Ed.), *New directions for methodology of social & behavioral science* (pp. 41-56). San Francisco, CA: Jossey-Bass.
- Lemola, S., Ledermann, T., & Friedman, E. M. (2013). Variability of sleep duration is related to subjective sleep quality and subjective well-being: an actigraphy study. *PLoS One*, 8(8), e71292. <https://doi.org/10.1371/journal.pone.0071292>

- Leskin, G. A., Woodward, S. H., Young, H. E., & Sheikh, J. I. (2002). Effects of comorbid diagnoses on sleep disturbance in PTSD. *Journal of Psychiatric Research*, 36(6), 449-452. [https://doi.org/10.1016/S0022-3956\(02\)00025-0](https://doi.org/10.1016/S0022-3956(02)00025-0)
- Lester, D. (2015). Morningness—Eveningness, Current Depression, and Past Suicidality. *Psychological Reports*, 116(2), 331-336. <https://doi.org/10.2466/16.02.PR0.116k18w5>
- Levin, R., & Nielsen, T. A. (2007). Disturbed dreaming, posttraumatic stress disorder, and affect distress: a review and neurocognitive model. *Psychological Bulletin*, 133(3), 482. <http://psycnet.apa.org/doi/10.1037/0033-2909.133.3.482>
- Li, S. X., Lam, S. P., Zhang, J., Yu, M. W. M., Chan, J. W. Y., Chan, C. S. Y., . . . Wing, Y. K. (2016). Sleep disturbances and suicide risk in an 8-year longitudinal study of schizophrenia-spectrum disorders. *Sleep*, 39(6), 1275-1282. <https://doi.org/10.5665/sleep.5852>
- Li, S. X., Zhang, B., Li, A. M., & Wing, Y. K. (2010). Prevalence and correlates of frequent nightmares: a community-based 2-phase study. *Sleep*, 33(6), 774-780. <https://doi.org/10.1093/sleep/33.6.774>
- Lim, J., & Dinges, D. F. (2010). A meta-analysis of the impact of short-term sleep deprivation on cognitive variables. *Psychological Bulletin*, 136(3), 375. <https://dx.doi.org/10.1037/a0018883>
- Lin, H.-C., Lee, H.-C., Kuo, N.-W., & Chu, C.-h. (2008). Hospital characteristics associated with post-discharge suicide of severely depressed patients. *Journal of Affective Disorders*, 110(3), 215-221. <https://doi.org/10.1016/j.jad.2008.01.030>
- Littlewood, D. L., Gooding, P., Kyle, S. D., Pratt, D., & Peters, S. (2016). Understanding the role of sleep in suicide risk: qualitative interview study. *BMJ Open*, 6(8), e012113. <https://doi.org/10.1136/bmjopen-2016-012113>
- Littlewood, D. L., Gooding, P. A., Panagioti, M., & Kyle, S. D. (2016). Nightmares and Suicide in Posttraumatic Stress Disorder: The Mediating Role of Defeat, Entrapment, and Hopelessness. *Journal of Clinical Sleep Medicine*, 12(3), 393-399. <https://doi.org/10.5664/jcsm.5592>
- Littlewood, D. L., Kyle, S. D., Carter, L. A., Peters, S., Pratt, D., & Gooding, P. (in press). Short sleep duration and poor sleep quality predict next-day suicidal ideation: An ecological momentary assessment study. *Psychological Medicine*.
- Littlewood, D. L., Kyle, S. D., Pratt, D., Peters, S., & Gooding, P. (2017). Examining the role of psychological factors in the relationship between sleep problems and suicide. *Clinical Psychology Review*, 54, 1-16. <https://doi.org/10.1016/j.cpr.2017.03.009>
- Liu, X., & Buysse, D. J. (2006). Sleep and youth suicidal behavior: A neglected field. *Current Opinion in Psychiatry*, 19(3), 288-293. doi: 10.1097/01.yco.0000218600.40593.18
- Lobbestael, J., Leurgans, M., & Arntz, A. (2011). Inter-rater reliability of the Structured Clinical Interview for DSM-IV Axis I disorders (SCID I) and Axis II disorders (SCID II). *Clinical Psychology and Psychotherapy*, 18(1), 75-79. <https://doi.org/10.1002/cpp.693>
- Lowe, C. J., Safati, A., & Hall, P. A. (2017). The neurocognitive consequences of sleep restriction: A meta-analytic review. *Neuroscience and Biobehavioral Reviews*, 80, 586-604. <https://doi.org/10.1016/j.neubiorev.2017.07.010>
- Malik, S., Kanwar, A., Sim, L. A., Prokop, L. J., Wang, Z., Benkhadra, K., & Murad, M. H. (2014). The association between sleep disturbances and suicidal behaviors in patients with psychiatric diagnoses: a systematic review and meta-analysis. *Systems Review*, 3(18). <https://doi.org/10.1186/2046-4053-3-18>
- Manea, L., Gilbody, S., & McMillan, D. (2015). A diagnostic meta-analysis of the Patient Health Questionnaire-9 (PHQ-9) algorithm scoring method as a screen for depression. *General Hospital Psychiatry*, 37(1), 67-75. <https://doi.org/10.1016/j.genhosppsych.2014.09.009>

- Marazziti, D., Consoli, G., Picchetti, M., Carlini, M., & Faravelli, L. (2010). Cognitive impairment in major depression. *European Journal of Pharmacology*, 626(1), 83-86. <https://doi.org/10.1016/j.ejphar.2009.08.046>
- Mars, B., Heron, J., Crane, C., Hawton, K., Kidger, J., Lewis, G., . . . Gunnell, D. (2014). Differences in risk factors for self-harm with and without suicidal intent: Findings from the ALSPAC cohort. *Journal of Affective Disorders*, 168, 407-414. <https://doi.org/10.1016/j.jad.2014.07.009>
- May, A. M., & Victor, S. E. (2018). From ideation to action: recent advances in understanding suicide capability. *Current Opinion in Psychology*, 22, 1-6. <https://doi.org/10.1016/j.copsyc.2017.07.007>
- McCall, W. V., Batson, N., Webster, M., Case, L. D., Joshi, I., Derreberry, T., . . . Farris, S. R. (2013). Nightmares and dysfunctional beliefs about sleep mediate the effect of insomnia symptoms on suicidal ideation. *Journal of Clinical Sleep Medicine*, 9(2), 135-140. <https://dx.doi.org/10.5664/jcsm.2408>
- McCall, W. V., & Black, C. G. (2013). The link between suicide and insomnia: Theoretical mechanisms. *Current Psychiatry Reports*, 15(9), 389. <https://doi.org/10.1007/s11920-013-0389-9>
- McCall, W. V., Blocker, J. N., D'Agostino, R., Jr., Kimball, J., Boggs, N., Lasater, B., & Rosenquist, P. B. (2010). Insomnia severity is an indicator of suicidal ideation during a depression clinical trial. *Sleep Medicine*, 11(9), 822-827. <https://doi.org/10.1016/j.sleep.2010.04.004>
- McGirr, A., Renaud, J., Seguin, M., Alda, M., & Turecki, G. (2008). Course of major depressive disorder and suicide outcome: A psychological autopsy study. *The Journal of Clinical Psychiatry*, 69(6), 966-970. Retrieved from <http://www-psychiatrist-com.manchester.idm.oclc.org/jcp/article/Pages/2008/v69n06/v69n0612.aspx>
- McManus, S., Bebbington, P., Jenkins, R., & Brugha, T. (2016). *Mental health and wellbeing in england: Adult psychiatric morbidity survey 2014*. Leeds: NHS Digital.
- McMillan, D., Gilbody, S., Beresford, E., & Neilly, L. (2007). Can we predict suicide and non-fatal self-harm with the Beck Hopelessness Scale? A meta-analysis. *Psychological Medicine*, 37(6), 769-778. <https://doi.org/10.1017/S0033291706009664>
- Michaels, M. S., Balthrop, T., Nadorff, M. R., & Joiner, T. E. (2017). Total sleep time as a predictor of suicidal behaviour. *Journal of Sleep Research*. <https://doi.org/10.1111/jsr.12563>
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The prisma statement. *Annals of Internal Medicine*, 151(4), 264-269. doi:10.7326/0003-4819-151-4-200908180-00135
- Mulligan, L. D., Haddock, G., Emsley, R., Neil, S. T., & Kyle, S. D. (2016). High resolution examination of the role of sleep disturbance in predicting functioning and psychotic symptoms in schizophrenia: A novel experience sampling study. *Journal of Abnormal Psychology*, 125(6), 788-797. doi:10.1037/abn0000180
- Mulligan, L. D., Haddock, G., Littlewood, D., & Kyle, S. D. (in press). Using experience sampling to examine the interaction between sleep and wakefulness in mental health science. In J. E. Palmier-Claus, G. Haddock, & F. Varese (Eds.), *A guide to experience sampling in mental health research and practice*. Chichester: Wiley.
- Nadorff, M. R., Anestis, M. D., Nazem, S., Harris, H. C., & Winer, E. S. (2014). Sleep disorders and the interpersonal-psychological theory of suicide: Independent pathways to suicidality? *Journal of Affective Disorders*, 152, 505-512. <https://doi.org/10.1016/j.jad.2013.10.011>
- Nadorff, M. R., Ellis, T. E., Allen, J. G., Winer, E., & Herrera, S. (2014). Presence and persistence of sleep-related symptoms and suicidal ideation in psychiatric inpatients. *Crisis*, 35(6), 398-405. <https://doi.org/10.1027/0227-5910/a000279>

- Nadorff, M. R., Fiske, A., Sperry, J. A., Petts, R., & Gregg, J. J. (2013). Insomnia symptoms, nightmares, and suicidal ideation in older adults. *Journals of Gerontology Series B-Psychological Sciences & Social Sciences*, 68(2), 145-152. <https://doi.org/10.1093/geronb/gbs061>
- Nadorff, M. R., Nazem, S., & Fiske, A. (2011). Insomnia symptoms, nightmares, and suicidal ideation in a college student sample. *Sleep*, 34(1), 93-98. <https://doi.org/10.1093/sleep/34.1.93>
- Nadorff, M. R., Nazem, S., & Fiske, A. (2013). Insomnia symptoms, nightmares, and suicide risk: duration of sleep disturbance matters. *Suicide and Life-Threatening Behavior*, 43(2), 139-149. <https://doi.org/10.1111/sltb.12003>
- National Confidential Inquiry into Suicide and Homicide by People with Mental Illness (NCISH). (2017). *Annual report 2017*. Retrieved from <http://research.bmh.manchester.ac.uk/cmhs/research/centreforsuicideprevention/nci/reports/2017-report.pdf>
- Ng, R. M., Di Simplicio, M., McManus, F., Kennerley, H., & Holmes, E. A. (2016). 'Flash-forwards' and suicidal ideation: A prospective investigation of mental imagery, entrapment and defeat in a cohort from the Hong Kong Mental Morbidity Survey. *Psychiatry Research*, 246, 453-460. <https://doi.org/10.1016/j.psychres.2016.10.018>
- Nielsen, T., & Levin, R. (2009). Dreams, dreaming theories and correlates of nightmares. In L. R. Squire (Ed.), *Encyclopedia of neuroscience* (pp. 663-669). Oxford: Academic Press.
- Nierenberg, A., Husain, M., Trivedi, M., Fava, M., Warden, D., Wisniewski, S., . . . Rush, A. (2010). Residual symptoms after remission of major depressive disorder with citalopram and risk of relapse: a STAR* D report. *Psychological Medicine*, 40(1), 41-50. <https://doi.org/10.1017/S0033291709006011>
- Nock, M. K., Borges, G., Bromet, E. J., Alonso, J., Angermeyer, M., Beautrais, A., . . . Williams, D. (2008). Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *The British Journal of Psychiatry*, 192(2), 98-105. doi:10.1192/bjp.bp.107.040113
- Nock, M. K., Hwang, I., Sampson, N., Kessler, R. C., Angermeyer, M., Beautrais, A., . . . De Girolamo, G. (2009). Cross-national analysis of the associations among mental disorders and suicidal behavior: findings from the WHO World Mental Health Surveys. *PLoS Medicine*, 6(8), e1000123. <https://doi.org/10.1371/journal.pmed.1000123>
- Nordentoft, M., & Mortensen, P. B. (2011). Absolute risk of suicide after first hospital contact in mental disorder. *Archives of General Psychiatry*, 68(10), 1058-1064. doi:10.1001/archgenpsychiatry.2011.113
- Norra, C., Richter, N., & Juckel, G. (2011). Sleep disturbances and suicidality: A common association to look for in clinical practise and preventive care. *EPMA Journal*, 2(3), 295-307. <https://doi.org/10.1007/s13167-011-0101-2>
- O'Connor, R. C. (2011). The integrated motivational-volitional model of suicidal behavior. *Crisis*, 32(6), 295-298. doi:10.1027/0227-5910/a000120
- O'Connor, R. C., & Nock, M. K. (2014). The psychology of suicidal behaviour. *The Lancet Psychiatry*, 1(1), 73-85. [https://doi.org/10.1016/S2215-0366\(14\)70222-6](https://doi.org/10.1016/S2215-0366(14)70222-6)
- O'Connor, R. C., Smyth, R., Ferguson, E., Ryan, C., & Williams, J. M. G. (2013). Psychological processes and repeat suicidal behavior: A four-year prospective study. *Journal of Consulting and Clinical Psychology*, 81(6), 1137. <http://psycnet.apa.org/doi/10.1037/a0033751>
- O'Sullivan, M., Rahim, M., & Hall, C. (2015). The prevalence and management of poor sleep quality in a secondary care mental health population. *Journal of Clinical Sleep Medicine*, 11(2), 111. <https://dx.doi.org/10.5664/jcsm.4452>
- Office for National Statistics (ONS). (2017). *Suicides in the UK: 2016 registrations*. Retrieved from

<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/suicidesintheunitedkingdom/2016registrations>

- Onwuegbuzie, A. J., & Leech, N. L. (2005). On becoming a pragmatic researcher: The importance of combining quantitative and qualitative research methodologies. *International journal of Social Research Methodology*, 8(5), 375-387. <https://doi.org/10.1080/13645570500402447>
- Osman, A., Bagge, C. L., Gutierrez, P. M., Konick, L. C., Kopper, B. A., & Barrios, F. X. (2001). The Suicidal Behaviors Questionnaire-Revised (SBQ-R): validation with clinical and nonclinical samples. *Assessment*, 8(4), 443-454. <https://doi.org/10.1177/107319110100800409>
- Owen, R., Dempsey, R., Jones, S., & Gooding, P. (2018). Defeat and entrapment in bipolar disorder: exploring the relationship with suicidal ideation from a psychological theoretical perspective. *Suicide and Life-threatening Behavior*, 48(1), 116-128. <https://doi.org/10.1111/sltb.12343>
- Owen, R., Gooding, P., Dempsey, R., & Jones, S. (2016). The experience of participation in suicide research from the perspective of individuals with bipolar disorder. *The Journal of Nervous and Mental Disease*, 204(11), 840-844. doi: 10.1097/NMD.0000000000000487
- Palmier-Claus, J. E., Myin-Germeys, I., Barkus, E., Bentley, L., Udachina, A., Delespaul, P. A., . . . Dunn, G. (2011). Experience sampling research in individuals with mental illness: reflections and guidance. *Acta Psychiatrica Scandinavica*, 123(1), 12-20. doi:10.1111/j.1600-0447.2010.01596.x
- Panagioti, M., Gooding, P. A., & Tarrier, N. (2012a). Hopelessness, defeat, and entrapment in posttraumatic stress disorder: their association with suicidal behavior and severity of depression. *The Journal of Nervous and Mental Disease*, 200(8), 676-683. doi:10.1097/NMD.0b013e3182613f91
- Panagioti, M., Gooding, P. A., & Tarrier, N. (2012b). A meta-analysis of the association between posttraumatic stress disorder and suicidality: the role of comorbid depression. *Comprehensive Psychiatry*, 53(7), 915-930. <https://doi.org/10.1016/j.comppsy.2012.02.009>
- Pederson, C. L., & Brook, J. B. (2017). Sleep disturbance linked to suicidal ideation in postural orthostatic tachycardia syndrome. *Nature and Science of Sleep*, 9, 109. <https://dx.doi.org/10.2147%2FNS.S128513>
- Perlis, M. L., Grandner, M. A., Brown, G. K., Basner, M., Chakravorty, S., Morales, K. H., . . . Dinges, D. F. (2016). Nocturnal wakefulness as a previously unrecognized risk factor for suicide. *The Journal of Clinical Psychiatry*, 77(6), e726-e733. doi: 10.4088/JCP.15m10131.
- Perlis, M. L., Grandner, M. A., Chakravorty, S., Bernert, R. A., Brown, G. K., & Thase, M. E. (2016). Suicide and sleep: Is it a bad thing to be awake when reason sleeps? *Sleep Medicine Reviews*, 29, 101-107. <https://doi.org/10.1016/j.smr.2015.10.003>
- Peters, S. (2010). Qualitative research methods in mental health. *Evidence-Based Mental Health*, 13(2), 35-40. doi: 10.1136/ebmh.13.2.35
- Petticrew, M., & Roberts, H. (2006). *Systematic reviews in the social sciences: A practical guide*. Malden, MA: Blackwell
- Pigeon, W. R. (2010). Insomnia as a risk factor for disease. In M. J. Sateia & D. J. Buysse (Eds.), *Insomnia: Diagnosis and treatment* (pp. 31-41). London: Informa Healthcare.
- Pigeon, W. R., Britton, P. C., Ilgen, M. A., Chapman, B., & Conner, K. R. (2012). Sleep disturbance preceding suicide among veterans. *American Journal of Public Health*, 102(1)(Suppl.), S93-97. <https://dx.doi.org/10.2105%2FAJPH.2011.300470>
- Pigeon, W. R., Pinquart, M., & Conner, K. (2012). Meta-analysis of sleep disturbance and suicidal thoughts and behaviors. *Journal of Clinical Psychiatry*, 73(9), e1160-1167. <http://psycnet.apa.org/doi/10.4088/JCP.11r07586>

- Pillai, V., Kalmbach, D. A., & Ciesla, J. A. (2011). A meta-analysis of electroencephalographic sleep in depression: evidence for genetic biomarkers. *Biological Psychiatry*, 70(10), 912-919. <https://doi.org/10.1016/j.biopsych.2011.07.016>
- Pitman, A. L., Osborn, D. P. J., Rantell, K., & King, M. B. (2016). Bereavement by suicide as a risk factor for suicide attempt: a cross-sectional national UK-wide study of 3432 young bereaved adults. *BMJ Open*, 6(1), e009948. <https://dx.doi.org/10.1136%2Fbmjopen-2015-009948>
- Qian, Y., Sun, L., Zhou, C., Ge, D., & Zhang, L. (2017). The association between suicidal ideation and sleep quality in elderly individuals: A cross-sectional study in Shandong, China. *Psychiatry Research*, 256, 453-457. doi: 10.1016/j.psychres.2017.07.017.
- Ramlee, F., Sanborn, A. N., & Tang, N. K. Y. (2017). What Sways People's Judgment of Sleep Quality? A Quantitative Choice-Making Study With Good and Poor Sleepers. *Sleep*, 40(7). doi:10.1093/sleep/zsx091
- Reynolds, W. M. (1991). Psychometric characteristics of the Adult Suicidal Ideation Questionnaire in college students. *Journal of Personality Assessment*, 56(2), 289-307. https://doi.org/10.1207/s15327752jpa5602_9
- Ribeiro, J. D., Pease, J. L., Gutierrez, P. M., Silva, C., Bernert, R. A., Rudd, M. D., & Joiner, T. E., Jr. (2012). Sleep problems outperform depression and hopelessness as cross-sectional and longitudinal predictors of suicidal ideation and behavior in young adults in the military. *Journal of Affective Disorders*, 136(3), 743-750. doi:10.1016/j.jad.2011.09.049
- Riemann, D., Berger, M., & Voderholzer, U. (2001). Sleep and depression—results from psychobiological studies: an overview. *Biological Psychology*, 57(1-3), 67-103. [https://doi.org/10.1016/S0301-0511\(01\)00090-4](https://doi.org/10.1016/S0301-0511(01)00090-4)
- Rihmer, Z., & Dome, P. (2016). Major mood disorders and suicidal behavior. In R. C. O'Connor & J. Pirkis (Eds.), *The international handbook of suicide prevention* (pp. 74-92). Chichester: Wiley.
- Roenneberg, T. (2015). Having Trouble Typing? What on Earth Is Chronotype? *Journal of Biological Rhythms*, 30(6), 487-491. doi:10.1177/0748730415603835
- Roth, T., & Drake, C. (2006). Defining insomnia: the role of quantitative criteria. *Sleep*, 29(4), 424-425.
- Rumble, M. E., Dickson, D., McCall, W. V., Krystal, A. D., Case, D., Rosenquist, P. B., & Benca, R. M. (2018). The relationship of person-specific eveningness chronotype, greater seasonality, and less rhythmicity to suicidal behavior: A literature review. *Journal of Affective Disorders*, 227, 721-730. <https://doi.org/10.1016/j.jad.2017.11.078>
- Russell, K., Rasmussen, S., & Hunter, S. C. (in press). Insomnia and nightmares as markers of risk for suicidal ideation in young people: Investigating the role of defeat and entrapment. *Journal of Clinical Sleep Medicine*. Retrieved from <https://strathprints.strath.ac.uk/id/eprint/63111>
- Sabo, E., Reynolds, C. F., 3rd, Kupfer, D. J., & Berman, S. R. (1991). Sleep, depression, and suicide. *Psychiatry Research*, 36(3), 265-277. [https://doi.org/10.1016/0165-1781\(91\)90025-K](https://doi.org/10.1016/0165-1781(91)90025-K)
- Sandman, N., Valli, K., Kronholm, E., Vartiainen, E., Laatikainen, T., & Paunio, T. (2017). Nightmares as predictors of suicide: an extension study including war veterans. *Scientific Reports*, 7, 44756. <https://dx.doi.org/10.1038%2Fsrep44756>
- Schredl, M. (2010). Nightmare frequency and nightmare topics in a representative German sample. *European Archives of Psychiatry and Clinical Neuroscience*, 260(8), 565-570. doi: 10.1007/s00406-010-0112-3.
- Séguin, M., Lesage, A., & Kiely, M. C. (1995). Parental bereavement after suicide and accident: a comparative study. *Suicide and Life-threatening Behavior*, 25(4), 489-498. <https://doi.org/10.1111/j.1943-278X.1995.tb00241.x>

- Selvi, Y., Aydin, A., Boysan, M., Atli, A., Agargun, M. Y., & Besiroglu, L. (2010). Associations between chronotype, sleep quality, suicidality, and depressive symptoms in patients with major depression and healthy controls. *Chronobiology International*, 27(9-10), 1813-1828. <https://doi.org/10.3109/07420528.2010.516380>
- Sheaves, B., Onwumere, J., Keen, N., Stahl, D., & Kuipers, E. (2015). Nightmares in patients with psychosis: the relation with sleep, psychotic, affective, and cognitive symptoms. *The Canadian Journal of Psychiatry*, 60(8), 354-361. <https://doi.org/10.1177/070674371506000804>
- Shneidman, E. S. (1964). Suicide, Sleep, and Death: Some Possible Interrelations among Cessation, Interruption, and Continuation Phenomena. *Journal of Consulting Psychology*, 28(2), 95-106. <http://psycnet.apa.org/doi/10.1037/h0048206>
- Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: new procedures and recommendations. *Psychological Methods*, 7(4), 422-445. <http://psycnet.apa.org/doi/10.1037/1082-989X.7.4.422>
- Siddaway, A. P., Taylor, P. J., Wood, A. M., & Schulz, J. (2015). A meta-analysis of perceptions of defeat and entrapment in depression, anxiety problems, posttraumatic stress disorder, and suicidality. *Journal of Affective Disorders*, 184, 149-159. <https://doi.org/10.1016/j.jad.2015.05.046>
- Silverman, M. M. (2016). Challenges to defining and classifying suicide and suicidal behaviours. In R. C. O'Connor & J. Pirkis (Eds.), *The international handbook of suicide prevention* (pp. 11-35). Chichester: Wiley.
- Sinclair, J., Harriss, L., Baldwin, D., & King, E. A. (2005). Suicide in depressive disorders: A retrospective case-control study of 127 suicides. *Journal of Affective Disorders*, 87(1), 107-113. doi:10.1016/j.jad.2005.03.001
- Singareddy, R. K., & Balon, R. (2001). Sleep and suicide in psychiatric patients. *Annals of Clinical Psychiatry*, 13(2), 93-101. <https://doi.org/10.1023/A:1016619708558>
- Sivertsen, B., Krokstad, S., Øverland, S., & Mykletun, A. (2009). The epidemiology of insomnia: Associations with physical and mental health: The HUNT-2 study. *Journal of Psychosomatic Research* 67, 109-116. <https://doi.org/10.1016/j.jpsychores.2009.05.001>
- Sjostrom, N., Hetta, J., & Waern, M. (2009). Persistent nightmares are associated with repeat suicide attempt: a prospective study. *Psychiatry Research*, 170(2-3), 208-211. <https://doi.org/10.1016/j.psychres.2008.09.006>
- Slade, K., Edelmann, R., Worrall, M., & Bray, D. (2014). Applying the Cry of Pain Model as a predictor of deliberate self-harm in an early-stage adult male prison population. *Legal and Criminological Psychology*, 19(1), 131-146. doi:10.1111/j.2044-8333.2012.02065.x
- Smith, J. A., Flowers, P., & Larkin, M. (2009). *Interpretative phenomenological analysis: Theory, method and research*. London: Sage.
- Smith, M. T., Perlis, M. L., & Haythornthwaite, J. A. (2004). Suicidal ideation in outpatients with chronic musculoskeletal pain: an exploratory study of the role of sleep onset insomnia and pain intensity. *Clinical Journal of Pain*, 20(2), 111-118. Retrieved from https://journals.lww.com/clinicalpain/Abstract/2004/03000/Suicidal_Ideation_in_Outpatients_With_Chronic.8.aspx
- Smith, M. T., Perlis, M. L., Park, A., Smith, M. S., Pennington, J., Giles, D. E., & Buysse, D. J. (2002). Comparative meta-analysis of pharmacotherapy and behavior therapy for persistent insomnia. *American Journal of Psychiatry*, 159(1), 5-11. <https://doi.org/10.1176/appi.ajp.159.1.5>
- Smith, P. N., Cukrowicz, K. C., Poindexter, E. K., Hobson, V., & Cohen, L. M. (2010). The acquired capability for suicide: A comparison of suicide attempters, suicide ideators, and non-suicidal controls. *Depression and Anxiety*, 27(9), 871-877. <https://doi.org/10.1002/da.20701>

- Snijders, T. A. (2005). Power and sample size in multilevel linear models. In B. S. Everitt & D. C. Howell (Eds.), *Encyclopedia of statistics in behavioral science* (pp. 1570-1573). Chichester: Wiley. doi:10.1002/0470013192.bsa492
- Snijders, T. A., & Bosker, R. B. (1999). *Multilevel analysis: An introduction to basic and applied multilevel analysis*. London: Sage.
- Spielberger, C. D. (1983). *Manual for the state-trait anxiety inventory: STAI*. Palo Alto, CA: Consulting Psychologists Press
- Spielberger, C. D. (2010). *State-Trait anxiety inventory*. Wiley Online Library. <https://doi.org/10.1002/9780470479216.corpsy0943>
- Spoormaker, V. I., Schredl, M., & van den Bout, J. (2006). Nightmares: from anxiety symptom to sleep disorder. *Sleep Medicine Reviews*, 10(1), 19-31. <https://doi.org/10.1016/j.smr.2005.06.001>
- Staniszewska, S., Brett, J., Simera, I., Seers, K., Mockford, C., Goodlad, S., . . . Denegri, S. (2017). GRIPP2 reporting checklists: tools to improve reporting of patient and public involvement in research. *Research Involvement and Engagement*, 3(1), 13. <https://doi.org/10.1186/s40900-017-0062-2>
- Suh, S., Schneider, M., Lee, R., & Joiner, T. (2016). Perceived interpersonal burdensomeness as a mediator between nightmare distress and suicidal ideation in nightmare sufferers. *Frontiers in Psychology*, 7, 1805. <https://doi.org/10.3389/fpsyg.2016.01805>
- Tanskanen, A., Tuomilehto, J., Viinamäki, H., Vartiainen, E., Lehtonen, J., & Puska, P. (2001). Nightmares as predictors of suicide. *Sleep*, 24(7), 844-847. <https://doi.org/10.1093/sleep/24.7.845>
- Tarrier, N., Gooding, P., Pratt, D., Kelly, J., Maxwell, J., & Awenat, Y. (2013). *Cognitive behavioural prevention of suicide in psychosis: a treatment manual*. Hove: Routledge.
- Taylor, D. J., & Pruiksma, K. E. (2014). Cognitive and behavioural therapy for insomnia (CBT-I) in psychiatric populations: a systematic review. *International Review of Psychiatry*, 26(2), 205-213. <https://doi.org/10.3109/09540261.2014.902808>
- Taylor, P. J., Awenat, Y., Gooding, P., Johnson, J., Pratt, D., Wood, A., & Tarrier, N. (2010). The subjective experience of participation in schizophrenia research: a practical and ethical issue. *The Journal of Nervous and Mental Disease*, 198(5), 343-348. <https://doi.org/10.1097/NMD.0b013e3181da8545>
- Taylor, P. J., Gooding, P., Wood, A. M., & Tarrier, N. (2011). The role of defeat and entrapment in depression, anxiety, and suicide. *Psychological Bulletin*, 137(3), 391. <http://psycnet.apa.org/doi/10.1037/a0022935>
- Taylor, P. J., Wood, A. M., Gooding, P., Johnson, J., & Tarrier, N. (2009). Are defeat and entrapment best defined as a single construct? *Personality and Individual Differences*, 47(7), 795-797. <https://doi.org/10.1016/j.paid.2009.06.011>
- Tononi, G., & Cirelli, C. (2006). Sleep function and synaptic homeostasis. *Sleep Medicine Reviews*, 10(1), 49-62. doi:10.1016/j.smr.2005.05.002
- Townsend, E., Wadman, R., Sayal, K., Armstrong, M., Harroe, C., Majumder, P., . . . Clarke, D. (2016). Uncovering key patterns in self-harm in adolescents: Sequence analysis using the Card Sort Task for Self-harm (CaTS). *Journal of Affective Disorders*, 206, 161-168. <https://doi.org/10.1016/j.jad.2016.07.004>
- Tripathy, J. P. (2013). Secondary data analysis: Ethical issues and challenges. *Iranian Journal of Public Health*, 42(12), 1478. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4441947/>
- Trockel, M., Karlin, B. E., Taylor, C. B., Brown, G. K., & Manber, R. (2015). Effects of cognitive behavioral therapy for insomnia on suicidal ideation in veterans. *Sleep*, 38(2), 259-265. doi:10.5665/sleep.4410
- Tsuno, N., Besset, A., & Ritchie, K. (2005). Sleep and depression. *The Journal of Clinical Psychiatry*, 66(10), 1254-1269. <http://psycnet.apa.org/doi/10.4088/JCP.v66n1008>

- Valenstein, M., Myra Kim, H., Ganoczy, D., F McCarthy, J., Zivin, K., L Austin, K., . . . Olfson, M. (2008). Higher-risk periods for suicide among VA patients receiving depression treatment: Prioritizing suicide prevention efforts. *Journal of Affective Disorders*, 112, 50-58. doi:10.1016/j.jad.2008.08.020
- Vallieres, A., Ivers, H., Bastien, C. H., Beaulieu-Bonneau, S., & Morin, C. M. (2005). Variability and predictability in sleep patterns of chronic insomniacs. *Journal of Sleep Research*, 14(4), 447-453. doi:10.1111/j.1365-2869.2005.00480.x
- van Mill, J. G., Hoogendijk, W. J., Vogelzangs, N., van Dyck, R., & Penninx, B. W. (2010). Insomnia and sleep duration in a large cohort of patients with major depressive disorder and anxiety disorders. *Journal of Clinical Psychiatry*, 71(3), 239. doi: 10.4088/JCP.09m05218gry.
- Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner Jr, T. E. (2010). The interpersonal theory of suicide. *Psychological review*, 117(2), 575. DOI: 10.1037/a0018697
- Walker, M. P. (2009). The role of sleep in cognition and emotion. *Annals of the New York Academy of Sciences*, 1156(1), 168-197. <https://doi.org/10.1111/j.1749-6632.2009.04416.x>
- Walsh, D., & Downe, S. (2006). Appraising the quality of qualitative research. *Midwifery*, 22(2), 108-119. doi:10.1016/j.midw.2005.05.004
- Williams, J. M. G. (1997). *Cry of pain: Understanding suicide and self-harm*. London: Penguin Books.
- Williams, J. M. G., Crane, C., Barnhofer, T., & Duggan, D. (2005). Psychology and suicidal behaviour: Elaborating the entrapment model. In K. Hawton (Ed.), *Prevention and treatment of suicidal behaviour: From science to practice* (pp. 71-90). Oxford: Oxford University Press.
- Willig, C. (2013). *Introducing qualitative research in psychology*. (3rd edition). Maidenhead : McGraw-Hill Education.
- Wilson, S. J., Nutt, D. J., Alford, C., Argyropoulos, S. V., Baldwin, D. S., Bateson, A. N., . . . Espie, C. A. (2010). British Association for Psychopharmacology consensus statement on evidence-based treatment of insomnia, parasomnias and circadian rhythm disorders. *Journal of Psychopharmacology*, 24(11), 1577-1601. <https://doi.org/10.1177/0269881110379307>
- Winsler, A., Deutsch, A., Vorona, R. D., Payne, P. A., & Szklo-Coxe, M. (2015). Sleepless in Fairfax: the difference one more hour of sleep can make for teen hopelessness, suicidal ideation, and substance use. *Journal of Youth and Adolescence*, 44(2), 362-378. doi:10.1007/s10964-014-0170-3
- Winsper, C., & Tang, N. K. Y. (2014). Linkages between insomnia and suicidality: Prospective associations, high-risk subgroups and possible psychological mechanisms. *International Review of Psychiatry*, 26(2), 189-204. <https://doi.org/10.3109/09540261.2014.881330>
- Woosley, J. A., Lichstein, K. L., Taylor, D. J., Riedel, B. W., & Bush, A. J. (2014). Hopelessness mediates the relation between insomnia and suicidal ideation. *Journal of Clinical Sleep Medicine*, 10(11), 1223-1230. doi:10.5664/jcsm.4208
- World Health Organisation. (1992). *The ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines* Retrieved from: <http://www.who.int/classifications/icd/en/bluebook.pdf>
- World Health Organisation. (2014). *Preventing suicide: a global imperative*. Retrieved from http://www.who.int/mental_health/suicide-prevention/world_report_2014/en/
- World Health Organisation. (2017). *Depression and other common mental disorders: global health estimates*. Retrieved from http://www.who.int/mental_health/management/depression/prevalence_global_health_estimates/en/

- World Medical Association. (2013). World medical association declaration of helsinki: Ethical principles for medical research involving human subjects. *JAMA*, 310(20), 2191-2194. doi:10.1001/jama.2013.281053
- Woznica, A. A., Carney, C. E., Kuo, J. R., & Moss, T. G. (2015). The insomnia and suicide link: Toward an enhanced understanding of this relationship. *Sleep Medicine Reviews*, 22, 37-46. <https://doi.org/10.1016/j.smr.2014.10.004>
- Wu, J. Q., Appleman, E. R., Salazar, R. D., & Ong, J. C. (2015). Cognitive behavioral therapy for insomnia comorbid with psychiatric and medical conditions: a meta-analysis. *JAMA Internal Medicine*, 175(9), 1461-1472. doi:10.1001/jamainternmed.2015.3006
- Yigletu, H., Tucker, S., Harris, M., & Hatlevig, J. (2004). Assessing suicide ideation: Comparing self-report versus clinician report. *Journal of the American Psychiatric Nurses Association*, 10(1), 9-15. DOI: 10.1177/1078390303262655
- Zuromski, K. L., Cero, I., & Witte, T. K. (2017). Insomnia symptoms drive changes in suicide ideation: A latent difference score model of community adults over a brief interval. *Journal of Abnormal Psychology*, 126(6), 739-749. doi:10.1037/abn0000282

Appendix A. MeSH terms tailored according to each electronic database.

Database	Suicide MeSH terms	Sleep MeSH terms
PsycINFO	suicide OR suicide prevention OR suicidal ideation OR attempted suicide OR suicid* OR parasuicide OR self destructive behaviour OR self*harm* OR NSSI* OR self injurious behaviour OR self inflicted wounds OR self mutilation OR DSH* OR drug overdoses OR self poison* OR overdose* OR hopelessness	sleep OR sleep disorders OR sleep deprivation OR sleep apnea OR sleep talking OR insomnia OR dysomnia OR narcolepsy OR hypersomnia OR sleepiness OR parasomnias OR sleepwalking OR nightmares OR night terror*
EMBASE	suicide OR suicid* OR suicidal behaviour OR suicide attempt OR parasuicid* OR suicidal ideation OR self*harm* OR self*injur* OR self-injury OR Self Injurious Behavior OR NSSI* automutilation OR DSH* OR drug overdose OR self poisoning OR self*poison* OR self*mutilat* OR self*destruct* OR self*inflict* OR overdose OR hopelessness	sleep OR circadian rhythm sleep disorder OR sleep disorder OR central sleep apnea syndrome OR sleep deprivation OR "International Classification of Sleep Disorders" OR sleep disordered breathing OR sleep quality OR sleep pattern OR sleep time OR insomnia OR primary insomnia OR narcolepsy OR hypersomnia OR sleep walking OR nightmare OR parasomnia OR night terror*
MEDLINE	suicidal OR suicidal ideation OR suicide, attempted OR suicid* OR parasuicid* OR self-injurious behaviour OR self*harm* OR self-injur* OR self-inflict* OR poisoning OR drug overdose OR self-poison* OR overdose OR NSSI* OR DSH* OR self mutilat* OR hopelessness	sleep OR sleep disorders OR dyssomnias OR sleep deprivation OR circadian rhythm OR parasomnias OR insomnia OR insomnia, fatal familial OR hypersomnia* OR night terrors OR nightmare* OR narcolepsy
Web of Science	suicid* OR self*harm* OR self-injur* OR self*injur* OR NSSI* OR DSH OR self*poison* OR self*destruct* OR overdose OR hopelessness	sleep* OR sleep disorders* OR sleep deprivation OR sleep apnea OR insomnia* OR dysomnia* OR narcolepsy OR hypersomnia* OR sleepiness OR parasomnia* OR sleepwalking OR night terror* OR nightmare*

Appendix B. Assessment criteria of the methodological quality of the studies.

Criterion	Rating for quantitative studies	Rating for qualitative studies
Methodology (Maximum of 6)		
Research question (RQ), aims and design	2 = Clear RQ/aims that were related to relevant theoretical frameworks, and an appropriate design. 1 = Clear RQ/aims with appropriate design. 0 = RQ/aims are not clear and/or design is not appropriate for RQ/aims.	2 = Clear RQ/aim which is appropriate for qualitative method selected and purpose made explicit, such as descriptive/explanatory intent, theory building, hypothesis testing. 1 = Clear RQ/aim which is appropriate for qualitative method selected. 0 = RQ/aims are not clear and/or method is not appropriate for RQ/aims.
Sampling method	1 = Appropriate for design. 0 = Not appropriate.	1 = Appropriate for design. 0 = Not appropriate.
Sample size	1 = Justified and satisfactory. 0 = Not justified.	1 = Justified. 0 = Not justified.
Data Collection	2 = Data collected using validated measurement tools throughout. 1 = Some use of validated tools, or non-validated measurement tools, but tools are available or described. 0 = No description of the measurement tool.	2 = Justified and clearly outlined (e.g., for interviews- how were they conducted? Who conducted them? Were they structured/semi-structured/un-structured? Was a topic guide used? Were they audio-recorded?) Triangulation of data sources if appropriate. 1 = Partly justified and outlined. 0 = Not clear.
Analysis (Maximum of 3)		
Reliability of analyses	2 = The study statistically controls for the most important and additional relevant confounding variables. 1 = The study statistically controls for the most important confounding variable (depression or other sleep problem). 0 = No control for confounding variables.	2 = Strategies to improve rigour of analyses as appropriate to outlined approach (i.e., deviant case analysis, inter-rater reliability, triangulation, member-checking) and analysis process is clearly documented. 1 = Analysis process is clearly documented and could be replicated. 0 = Insufficient detail regarding the analysis process.
Analysis is appropriate for RQ and aims	1 = Statistical test used to analyse the data is suitable and clearly described. Data reported in appropriate detail for the given statistical test, e.g., confidence intervals, probability level (p value). 0 = The statistical test is not appropriate, not clearly described or incomplete.	1 = Analysis is supported by sufficient data excerpts from a wide range of participants. 0 = Analysis is not well supported by data excerpts and/or there is an overreliance on specific participants.

The order and exact content of the questions will be determined by the participant and ongoing analysis. The following topics and prompts serve as an interview guide.

Sleep

- Can you tell me a bit about the way you sleep?
Prompts:
 - o What time do you usually go to bed/get up?
 - o Would you describe yourself as a morning or night person or neither?
 - o Do you ever have problems falling asleep/staying asleep?
 - o Do you ever feel sleepy in the daytime?
 - o If yes: - How does feeling sleepy affect you during the day?
 - o Do you sleep in the day?
 - o What symptoms? (trouble falling asleep, maintaining sleep, poor duration)
- Have there been any particular times in your life when you have noticed changes in your sleep?
Prompts:
 - Have there been any particular times when your sleep has been better/worse?
 - What do you think causes you to have poor sleep?
 - What do you think causes you to have good sleep?
 - What about when you have felt depressed, how would you describe your sleep then?
 - If the participant reports sleeping problems, clarify when did they start?
- When you think back to a time when you slept poorly, can you describe that time?
 - o Did it affect your everyday life?
 - o How?
- What about a time when you sleep well, can you describe that that time?
 - o Did it affect your everyday life?
 - o How?
- In terms of your personal experience of sleep problems, have things changed?
 - o How has it changed?
 - o Why do you think that is?
 - o Have you found any ways of managing your sleep problems so that it has a lesser impact on your life? Can you tell me about them?

Experience of suicidal thoughts, feelings or behaviours

- Thinking about the time you were experiencing suicidal thoughts/attempts, can you tell me a bit about what was going on at that time?
- When you think back to these specific times when you have experienced suicidal thoughts, can you remember how your sleep was? Can you describe that to me?
- Do you think your sleep problems have any effects on these thoughts and feelings?
 - o If yes, how?
 - o Have any aspects of your sleep problems worsened or intensified suicidal thoughts, feelings or behaviours? If yes, how?

- Or on the other hand, when you have had these thoughts and feelings, has that had any effect on your sleep problems? (How?)

Depression

- What about your experience of depression, when you are feeling depressed, how would you describe your sleep?
- And thinking about a time when you experienced good sleep, how would you describe your suicidal thoughts and behaviours at that time?
 - o More or less suicidal?
 - o Why do you think that is?
- Now thinking about your other symptoms of depression aside from sleep problems, can you think of any ways those symptoms effect these sorts of suicidal thoughts?

Appendix D. EMA Item list.

Variable	Item 1	Item 2	Item 3
Tired	Right now, I feel tired		
Suicidal thoughts	Right now, I feel suicidal	Since the last beep, I have thought about suicide	
Passive death ideation	Right now, I feel life isn't worth living		
Negative affect	Right now, I feel anxious	Right now, I feel sad	Right now, I feel tense
Positive affect	Right now, I feel happy	Right now, I feel energetic	Right now, I feel relaxed
Defeat	Right now, I feel emotionally defeated		
Entrapment	Right now, I feel trapped	Right now, I want to escape my emotional pain	
Future appraisals	Right now, I feel optimistic	Right now, I feel hopeful about the future	
Hopelessness	Right now, I feel hopeless		
Self-worth	Right now, I feel good about myself	Right now, I feel worthless	
Emotional coping	Right now, I'm in control of my emotions	Since the last beep, my emotions were all over the place	
Socially supported	Right now, I feel I have someone to turn too	Right now, I feel others understand me	
Thwarted belongingness	Right now, I feel needed	Right now, I feel I belong	
Loneliness	Right now, I feel lonely		
Isolation	Right now, I feel isolated		
Irritability	Right now, I feel irritated		
Argumentative	Right now, I feel argumentative		
Problem solving	Right now, I can deal with my problems	Right now, my problems feel like a burden	
Mental strength	Right now, I feel mentally strong		
Thought control	Right now, I feel I can control my thoughts		
Rumination-(brooding)	Since the last beep, I have been dwelling on things	Since the last beep, I have been mulling things over	
Worry	Right now, I feel worried		
Resilience	Right now, I feel resilient		
Activity	Since the last beep, I have been active		
Physical pain	Right now, I am in physical pain		

Appendix E. Pittsburgh Sleep Quality Index

Participant ID Number

Date:

INSTRUCTIONS: The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, what time have you usually gone to bed at night?
BED TIME _____
2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?
NUMBER OF MINUTES _____
3. During the past month, what time have you usually gotten up in the morning?
GETTING UP TIME _____
4. During the past month, a) how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)
HOURS OF ACTUAL SLEEP PER NIGHT _____
b) how many hours were you in bed?
HOURS SPENT IN BED PER NIGHT _____

For each of the remaining questions, circle the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you . . .				
a) Cannot get to sleep within 30 minutes	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
b) Wake up in the middle of the night or early morning	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
c) Have to get up to use the bathroom	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
d) Cannot breathe comfortably	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
e) Cough or snore loudly	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
f) Feel too cold	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
g) Feel too hot	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
h) Had bad dreams	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
i) Have pain	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week

j) Other reason(s), please describe, including how often you have had trouble sleeping because of this reason (s):				
6. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
8. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?	No problem at all	Only a very slight problem	Somewhat a problem	A very big problem
9. During the past month, how would you rate your sleep quality overall?	Very good	Fairly good	Fairly bad	Very Bad
10. Do you have a bed partner or room mate?	No be partner or room mate	Partner/ room mate in other room	Partner in same room, but not same bed	Partner in same bed
If you have a room mate or bed partner, ask him/her how often in the past month you have had....				
a) Loud snoring	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
b) Long pauses between breaths while asleep	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
c) Legs twitching or jerking while you sleep	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
d) Episodes of disorientation or confusion during sleep	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
e) Other restlessness while you sleep, please describe below....	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week

Appendix F. The Sleep Condition Indicator

Participant ID Number:

Date:

Instructions: Please answer the questions below by circling the answer to the right of the statement. If you have difficulty with a statement, then choose the response that is mostly right.

<i>Thinking about a typical night in the last month ...</i>					
1. ... how long does it take you to fall asleep?	0 – 15 min	16 – 30 min	31 – 45 min	46 – 60 min	≥ 61 min
2. ... if you then wake up during the night ... how long are you awake for in total? (add all the awakenings up)	0 – 15 min	16 – 30 min	31 – 45 min	46 – 60 min	≥ 61 min
3. ... how many nights a week do you have a problem with your sleep?	0 - 1	2	3	4	5 - 7
4. ... how would you rate your sleep quality?	Very good	Good	Average	Poor	Very poor
<i>Thinking about the past month, to what extent has poor sleep ...</i>					
5. ... affected your mood, energy, or relationships?	Not at all	A little	Somewhat	Much	Very much
6. ... affected your concentration, productivity, or ability to stay awake	Not at all	A little	Somewhat	Much	Very much
7. ... troubled you in general	Not at all	A little	Somewhat	Much	Very much
Finally ...					
8. ... how long have you had a problem with your sleep?	I don't have a problem / Less than 1 month	1 – 2 months	3 – 6 months	7 – 12 months	More than a year

Appendix G. Brief sleep screen

ID number

Date

Instructions: Researcher will ask the lead numbered question, and then proceed with supplementary only if the participant answers 'yes'.

1. Do you sometimes fall asleep in the daytime completely without warning?	Yes	No
If answer is yes, continue to question 1a. If answer is no please skip to question 2		
1a. Is it literally impossible to resist 'sleep attacks' during the day?	Yes	No
1b. Do you have collapses or extreme muscle weakness triggered by extreme emotion?	Yes	No
1c. Do you have visual hallucinations, either just as you fall asleep or when you wake in the morning?	Yes	No
1d. Are you paralysed and unable to move when you wake up from your sleep?	Yes	No
2. Are you a very heavy snorer?	Yes	No
If answer is yes, continue to question 2a. If answer is no please skip to question 3		
2a. Does your partner say that you sometimes stop breathing?	Yes	No
2b. Do you often wake up gasping for a breath?	Yes	No
2c. Are you often excessively sleepy during the day or fall asleep without wanting to?	Yes	No
3. Do your legs often twitch or jerk or can't keep still in bed?	Yes	No
If answer is yes, continue to question 3a. If answer is no please skip to question 4		
3a. Is it very difficult to get to sleep because of repeated muscle jerks?	Yes	No
3b. Do you frequently wake from sleep with sudden jerky movements or with a compulsion to move your legs?	Yes	No
3c. Do you simply have to get out of bed and pace around to get rid of these feelings?	Yes	No
4. Do you tend to sleep well but just at the "wrong times"?	Yes	No
If answer is yes, continue to question 4a. If answer is no please skip to question 5		
4a. Can you sleep well enough, but only if you stay up very late?	Yes	No
4b. Are you in a very sound sleep at normal waking time and could sleep on for hours more?	Yes	No
4c. Can you sleep well enough, but only if you go to bed very early?	Yes	No
4d. Do you wake very early, bright and alert and no longer sleepy?	Yes	No
5. Do you have unusual behaviours associated with your sleep that trouble you or that are dangerous?	Yes	No
If answer is yes, continue to question 5a. If answer is no then you have now finished the questionnaire		
5a. Do you sleepwalk frequently and run the risk of injuring yourself or others?	Yes	No
5b. Do you have frequent night terrors when you are extremely distressed but not properly awake?	Yes	No
5c. Do you act out your dreams and risk injuring yourself or others?	Yes	No
5d. Do you have terrible recurring nightmares?	Yes	No

Appendix H. Sleep Diary

Sleep Diary Instructions (CSD-E)

General Instructions

What is a Sleep Diary? A sleep diary is designed to gather information about your daily sleep pattern.

How often and when do I fill out the sleep diary? It is necessary for you to complete your sleep diary every day. If possible, the sleep diary should be completed within one hour of getting out of bed in the morning. The Nighttime Sleep Diary questions can be completed before you go to bed at night.

What should I do if I miss a day? If you forget to fill in the diary or are unable to finish it, leave the diary blank for that day.

What if something unusual affects my sleep or how I feel in the daytime? If your sleep or daytime functioning is affected by some unusual event (such as an illness, or an emergency) you may make brief notes on your diary.

What do the words “bed” and “day” mean on the diary? This diary can be used for people who are awake or asleep at unusual times. In the sleep diary, the word “day” is the time when you choose or are required to be awake. The term “bed” means the place where you usually sleep.

Will answering these questions about my sleep keep me awake? This is not usually a problem. You should not worry about giving exact times, and you should not watch the clock. Just give your best estimate.

Morning Sleep Diary Item Instructions

Use the guide below to clarify what is being asked for each item of the Sleep Diary. Date: Write the date of the morning you are filling out the diary.

1. *What time did you get into bed?* Write the time that you got into bed. This may not be the time you began “trying” to fall asleep.
2. *What time did you try to go to sleep?* Record the time that you began “trying” to fall asleep.
3. *How long did it take you to fall asleep?* Beginning at the time you wrote in question 2, how long did it take you to fall asleep.
4. *How many times did you wake up, not counting your final awakening?* How many times did you wake up between the time you first fell asleep and your final awakening?
- 5a. *In total, how long did these awakenings last?* What was the total time you were awake between the time you first fell asleep and your final awakening. For example, if you woke 3 times for 20 minutes, 35 minutes, and 15 minutes, add them all up (20+35+15= 70 min or 1 hr and 10 min).
- 5b. *Where any of these awakenings because of a nightmare?* If you woke up because of a bad, or distressing dream then please tick yes.
- 6a. *What time was your final awakening?* Record the last time you woke up in the morning.
- 6b. *After your final awakening, how long did you spend in bed trying to sleep?* After the last time you woke-up (Item #6a), how many minutes did you spend in bed trying to sleep? For example, if you woke up at 8 am but continued to try and sleep until 9 am, record 1 hour.
- 6c. *Did you wake up earlier than you planned?* If you woke up or were awakened earlier than you planned, check yes. If you woke up at your planned time, check no.
- 6d. *If yes, how much earlier?* If you answered “yes” to question 6c, write the number of minutes you woke up earlier than you had planned on waking up. For example, if you woke up 15 minutes before the alarm went off, record 15 minutes here.

7. *What time did you get out of bed for the day?* What time did you get out of bed with no further attempt at sleeping? This may be different from your final awakening time (e.g. you may have woken up at 6:35 a.m. but did not get out of bed to start your day until 7:20 a.m.)

8. *In total, how long did you sleep?* This should just be your best estimate, based on when you went to bed and woke up, how long it took you to fall asleep, and how long you were awake. You do not need to calculate this by adding and subtracting; just give your best estimate.

9. *How would you rate the quality of your sleep?* "Sleep Quality" is your sense of whether your sleep was good or poor.

10. *How restful or refreshed did you feel when you woke up for the day?* This refers to how you felt after you were done sleeping for the night, during the first few minutes that you were awake.

11. *Did your thoughts make it difficult to fall asleep or return to sleep?* If yes what were you thinking about? If your thoughts made it difficult to fall asleep initially, and/ or if you woke up in the night and then found it difficult to return to sleep because of your thoughts, then you should tick yes and add a comment to explain the types of things you were thinking about

Nighttime Sleep Diary Item Instructions

Please complete the following items before you go to bed. Date: Write the date of the morning you are filling out the diary.

12a. *How many times did you nap or doze?* A nap is a time you decided to sleep during the day, whether in bed or not in bed. "Dozing" is a time you may have nodded off for a few minutes, without meaning to, such as while watching TV. Count all the times you napped or dozed at any time from when you first got out of bed in the morning until you got into bed again at night.

12b. *In total, how long did you nap or doze?* Estimate the total amount of time you spent napping or dozing, in hours and minutes. For instance, if you napped twice, once for 30 minutes and once for 60 minutes, and dozed for 10 minutes, you would answer "1 hour 40 minutes." If you did not nap or doze, write "N/A" (not applicable).

13a. *How many drinks containing alcohol did you have?* Enter the number of alcoholic drinks you had where 1 drink is defined as half pint of regular beer, larger or cider, 1 small glass of wine, or 1 single measure of spirits

13b. *What time was your last drink?* If you had an alcoholic drink yesterday, enter the time of day in hours and minutes of your last drink. If you did not have a drink, write "N/A" (not applicable).

14a. *How many caffeinated drinks (coffee, tea, soda, energy drinks) did you have?* Enter the number of caffeinated drinks (coffee, tea, soda, energy drinks) you had where for coffee and tea, one drink = 1 cup; while for caffeinated soda one drink = 1 regular 330ml can.

14b. *What time was your last caffeinated drink?* If you had a caffeinated drink, enter the time of day in hours and minutes of your last drink. If you did not have a caffeinated drink, write "N/A" (not applicable).

15. *Did you take any over-the-counter or prescription medication(s) to help you sleep?* If so, list medication(s), dose, and time taken: List the medication name, how much and when you took EACH different medication you took tonight to help you sleep. Include medication available over the counter, prescription medications, and herbals (example: "Sleepwell 50 mg 11 pm"). If every night is the same, write "same" after the first day

16. *Comments:* If you have anything that you would like to say that is relevant to your sleep feel free to write it here.



Morning section - (Please Complete Upon Awakening)

ID:

Today's Date	4/2/16							
1. What time did you get into bed?	10:00 pm							
2. What time did you try to go to sleep?	10:30 pm							
3. How long did it take you to fall asleep?	10 mins							
4. How many times did you wake up, not counting your final awakening?	2							
5a. In total, how long did these awakenings last?	10 mins							
5b. Where any of these awakenings because of a nightmare?	☐ Yes ☒ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
6a. What time was your final awakening?	8:00 am							
6b. After your final awakening, how long did you spend in bed trying to sleep?	0							
6c. Did you wake up earlier than you planned?	☐ Yes ☒ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
6d. If yes, how much earlier?								
7. What time did you get out of bed for the day?	8:10 am							
8. In total, how long did you sleep?	9hrs 20 mins							
9. How would you rate the quality of your sleep?	☐ Very poor ☐ Poor ☐ Fair ☒ Good ☐ Very good	☐ Very poor ☐ Poor ☐ Fair ☐ Good ☐ Very good	☐ Very poor ☐ Poor ☐ Fair ☐ Good ☐ Very good	☐ Very poor ☐ Poor ☐ Fair ☐ Good ☐ Very good	☐ Very poor ☐ Poor ☐ Fair ☐ Good ☐ Very good	☐ Very poor ☐ Poor ☐ Fair ☐ Good ☐ Very good	☐ Very poor ☐ Poor ☐ Fair ☐ Good ☐ Very good	☐ Very poor ☐ Poor ☐ Fair ☐ Good ☐ Very good
10. How rested or refreshed did you feel when you woke-up for the day?	☐ Not at all rested ☐ Slightly rested ☐ Somewhat rested ☐ Well-rested ☒ Very well-rested	☐ Not at all rested ☐ Slightly rested ☐ Somewhat rested ☐ Well-rested ☐ Very well-rested	☐ Not at all rested ☐ Slightly rested ☐ Somewhat rested ☐ Well-rested ☐ Very well-rested	☐ Not at all rested ☐ Slightly rested ☐ Somewhat rested ☐ Well-rested ☐ Very well-rested	☐ Not at all rested ☐ Slightly rested ☐ Somewhat rested ☐ Well-rested ☐ Very well-rested	☐ Not at all rested ☐ Slightly rested ☐ Somewhat rested ☐ Well-rested ☐ Very well-rested	☐ Not at all rested ☐ Slightly rested ☐ Somewhat rested ☐ Well-rested ☐ Very well-rested	☐ Not at all rested ☐ Slightly rested ☐ Somewhat rested ☐ Well-rested ☐ Very well-rested

11. Did your thoughts make it difficult to fall asleep or return to sleep? If yes what were you thinking about?	☐ Yes ☐ No A job interview I have tomorrow	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
---	---	--	--	--	--	--	--	--

Nighttime section (Please Complete Before Bed)

ID/NAME: _____

Today's Date	4/2/16							
12a. How many times did you nap or doze?	2 times							
12b. In total, how long did you nap or doze?	1 hour 10 min.							
13a. How many drinks containing alcohol did you have?	3 drinks							
13b. What time was your last drink?	9 :20 p.m.							
14a. How many caffeinated drinks (coffee, tea, soda, energy drinks) did you have?	2 drinks							
14b. What time was your last drink?	3:00 p.m.							
15. Did you take any over-the-counter or prescription medication(s) to help you sleep? If so, list medication(s), dose, and time taken	☒ Yes ☐ No Medication(s): Relaxo-Herb Dose: 50 mg Time(s) taken: 11 pm	☐ Yes ☐ No Medication(s): Dose: Time(s) taken:	☐ Yes ☐ No Medication(s): Dose: Time(s) taken:	☐ Yes ☐ No Medication(s): Dose: Time(s) taken:	☐ Yes ☐ No Medication(s): Dose: Time(s) taken:	☐ Yes ☐ No Medication(s): Dose: Time(s) taken:	☐ Yes ☐ No Medication(s): Dose: Time(s) taken:	☐ Yes ☐ No Medication(s): Dose: Time(s) taken:
16. Comments (if applicable)	I have a cold							

Appendix J. Patient Health Questionnaire (PHQ-9)

Participant:

Date:

Administered by researcher via the telephone to confirm eligibility into the study.

Over the last 2 weeks, how often have you been bothered by any of the following problems?				
1. Little interest or pleasure in doing things	Not at all	Several days	More than half the days	Nearly every day
2. Feeling down, depressed, or hopeless	Not at all	Several days	More than half the days	Nearly every day
3. Trouble falling or staying asleep, or sleeping too much	Not at all	Several days	More than half the days	Nearly every day
4. Feeling tired or having little energy	Not at all	Several days	More than half the days	Nearly every day
5. Poor appetite or overeating	Not at all	Several days	More than half the days	Nearly every day
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	Not at all	Several days	More than half the days	Nearly every day
7. Trouble concentrating on things, such as reading the newspaper or watching television	Not at all	Several days	More than half the days	Nearly every day
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	Not at all	Several days	More than half the days	Nearly every day
9. Thoughts that you would be better off dead or of hurting yourself in some way	Not at all	Several days	More than half the days	Nearly every day

Scoring

Not at all = 0	Several days = 1	More than half the days = 2	Nearly every day = 3
-------------------	---------------------	--------------------------------	-------------------------

To be eligible potential participant responses must total a score of 10 or more, which indicates they are likely to meet the criteria for major depressive disorder as identified via the longer assessment (SCID).

PART 1: Overview

This protocol directs the practice of Donna Littlewood during the data collection phase of her PhD studies. There is some potential for the participants to feel distressed during the study as the nature of the research may involve the consideration of events, thoughts and feelings which participants may find distressing, for example, feelings of hopelessness, depression and suicidal ideation.

To minimise the risk of a participant becoming distressed during the research process, the following protocol will be instigated:

1. The participant information sheet will clearly state that the study will include:
 - a. an interview and questionnaires that require participants to recall experiences relating to suicidal thoughts, feelings and depression.
 - OR
 - b. multiple assessment of mood and suicidal thoughts for the duration of the study (6 times per day, for the 7 day study period). It will also be made clear that questionnaires completed during briefing sessions will also require participants to recall experiences relating to suicidal thoughts, feelings and depressed symptoms.
2. Potential participants will be given at least 24 hours between being sent the participant information sheet and consenting to the study. The consent form contains a question which checks that this is the case.
3. The researcher will ensure that the study has been comprehensively explained to all participants before they consent so that they are fully informed and aware of what their participation entails.
4. Participants will be reassured that they do not need to answer any questions they do not want to and it will be emphasised that they can withdraw from the study at any time.
5. The study will not commence until the researcher is satisfied that the participant is aware of the procedure, and has had the opportunity to ask any questions that they may have.
6. The researcher will emphasise to the participants that their data will remain confidential, with the exception that the researcher is obliged to disclose any information that poses a risk to the health and safety of the participant or others. The specific issue is whether the participant's well-being is a cause for concern regarding their level of suicidal thoughts and feelings.
7. Participants will need to provide their designated health care contact's name, occupation, email address, and telephone number so that they can be contacted if necessary (see points 8, 9 and 10). A copy of the participant consent form and information sheet will be routinely sent to the designated healthcare contact following participation within the study. This will be sent by recorded delivery
8. Participants will be referred to health care professionals under the following circumstances:
 - a. Beck Scale for Suicidal Ideation - *Q9 Can you keep yourself from committing suicide?* If the participant answers that they are unsure

about this then this will trigger the immediate referral process as described in full within the risk protocol.

- b. Should the researcher feel that the participant displays any signs of distress during the research process (including check-in phone calls)
9. During the EMA study, the researcher will make call the participant on day 1 and 4 to check how the participant is getting on with the equipment, if they feel at risk of harming themselves, if they feel worse as a consequence of participating within the study. If they indicate that they do, the participant will be reminded that they may choose to withdraw from the study at any time. Any concerns regarding the participant's ability to keep themselves safe will be referred as per the protocol. In addition, it will be explained to the participant that they can request additional check in calls from the researcher on the other days of the study, if they feel this would help them with the study. The content and purpose of these calls will be explained with participants at the outset prior to consent.
10. In the event of any of the above conditions (detailed in points 8a, 8b and 9), the researcher will discuss their concerns with the participant and inform them that as a duty of care they will pass on this information to their nominated health care contact. The researcher will contact via telephone or email the health contact immediately following the discussion with the participant
11. At the end of the repeated EMA assessments, the following message will be displayed on the PRO-Diary watch (CamNtech, Cambridge) to remind participants to seek help should they feel unable to keep themselves safe: *"We would like to remind you that if you currently feel unable to keep yourself safe or are in danger of harming yourself, please seek emergency help by calling 999 or visiting your local A&E".*
12. At the end of the interview study, a debriefing protocol will be implemented that has been used successfully by our research group in studies with clinical samples and which seeks to induce positive mood states.
13. Following the completion of the study, participants will again have the opportunity to ask any further questions or request clarification of any issue.
14. As part of the debriefing protocol all participants will also be provided with a contact list of organisations and helplines related to mental health at the end of the study (e.g. Samaritans, Helpline, Self Help, the Sanctuary etc). This will include a web-based self-help guide for sleep problems.
15. Furthermore, the chief investigator (DL) will call each participant on the day following completion of the questionnaires and interview to check on the participant's wellbeing. If distress or risk is indicated on this follow-up contact, then the information will be followed as per the specific details outlined in Part 2 below.
16. In addition, the researcher will maintain regular contact throughout the research project with their clinical supervisor, Dr Daniel Pratt, who is a Clinical Psychologist and Lecturer working in the field of suicide. Specifically, if the researcher has any concerns regarding risk, they will contact Dr Pratt to discuss and seek guidance.

PART 2: Screening risk and responding appropriately

Why? During any contact with participants, they may indicate an intention to harm themselves or others. Alternatively they may provide information to the effect that

a child or other vulnerable person may be in danger. Any information of this nature **must** be acted upon.

At the beginning of each research study the participant will be informed that what is discussed is private and confidential except if they indicate any current intention to harm themselves or others, or if they provide information to the effect that a child or other vulnerable person may be in danger. In such situations the researcher has a duty to break confidentiality.

Responding to participant disclosure

The researcher will review the self-report questionnaire measures and notify the health care contact in the event that participants report that they have experienced suicidal thoughts or behaviours within the study.

In the case that the individual indicates current intention to harm themselves or others the action taken is to remind the participant of researcher's Duty of Care to break confidentiality where risk is identified (as previously outlined at the commencement of the study) and contact the identified health care contact (e.g., care co-ordinator and / or psychiatrist or GP) to verbally report the situation. This notification will be made by telephone and confirmed in writing based on the following agreed standard format:

"During the course of participation within a research study on (date), (patient's full name) disclosed information indicating risk of harm to him/herself / and / or others (specify as appropriate). This has been verbally reported to XX (Health care contacts full name and time reported)"

In instances where the researcher is unable to speak directly to the healthcare contact (e.g., GP's in surgery) then contact details for the researcher will be left with a request for the contact to return the call. In addition, if the contact can be contacted via email then an email will also be sent. If there is no email address, this information will be reported via post sent by recorded delivery.

The immediacy of this action will depend upon the time frame involved.

If an imminent risk is identified, i.e. the individual reports that they intend to harm themselves within the **next 48 hours**, or they currently feel unable to keep themselves safe, then immediate action should be taken and the session should immediately change focus to the imminent risk and explain the need to notify crisis or emergency services as appropriate. Following this, the researcher would also update the designated healthcare contact. If any immediate risk is identified during a check in phone call, the researcher would follow the same procedure.

However if the individual reports current thoughts but does not disclose any intent to act on these thoughts, then action by the researcher may involve continuing with the research in light of the information discussed, reviewing how the participant is feeling on a daily basis throughout the course of the study and also contacting their designated healthcare contact (i.e.GP/ care-coordinator / psychiatrist).

If the individual indicates that a child / other vulnerable person may be in danger the action taken would be to call the respective Child or Adult Safeguarding Team (see contact details below).

In either eventuality the participant will be informed that confidentiality needs to be broken and, if at all possible, will be encouraged to work in collaboration with the researcher to this end.

Unless there are circumstances that would contraindicate (e.g., risk to safety the researcher), the participant should be informed that this action is to be taken.

Immediate action

If this scenario occurs during face to face contact the individual may be given the option of phoning the health care contact themselves in the presence of the researcher or staying in the room whilst a call is made. Alternatively the individual may choose to wait in a safe place, such as, an adjoining room.

In the eventuality that the health care contacts are not contactable a call should be made to the Crisis Team or A&E.

If the scenario occurs during a telephone contact the individual will be informed that confidentiality will need to be breached. The same plan as above will be implemented and the individual should be called back to feedback the planned actions.

In the eventuality that the individual discloses that a child / vulnerable adult may be in danger the Child / Adult Safeguarding Team should be contacted. If it is outside of 9am – 5pm and there is considered to be imminent risk to a child / vulnerable adult the police should be informed. Details of out of hours Child / vulnerable Adult Safeguarding Team services.

In situations where the researcher is uncertain of whether information disclosed by a participant constitutes a risk, contact will be made with Dr Daniel Pratt by phone who will advise on the appropriate action. If it is not possible to make contact with Dr Daniel Pratt, the researcher will contact another member of the supervisory team for guidance.

DISCLOSURE OF RISK DURING RESEARCH

Researchers are to follow these guidelines in the event that, when conducting research with a participant, they identify that a participant might be at risk, or could pose a risk either to themselves or to others. The examples presented here are to be modified according to the situation.

- **Prior to commencing the research study**, the researcher will carefully explain that, although the research data is going to be confidential, if any risk is identified or disclosed during discussions or in the study then the researcher will have to communicate these concerns to other professionals:

“Before we begin the research, I just want to explain again that what we will talk about and your responses in the diary will be confidential, but if I feel that there might be a risk in what you are saying, for example to yourself or to others, I will need to pass this on to the appropriate contact, such as your healthcare contact. But if I do this, I will tell you”.

- **Check-in phone-calls during the EMA research study**. The researcher will call the participant on day 1 and 4 to check whether the participant is feeling at risk or that the study is having an adverse effect on their wellbeing. The content and purpose of these calls will be explained with participants at the outset prior to consent. Specifically they will be asked

"How are getting on with equipment? How are you doing generally? Is taking part in this study making you feel worse? Do you want to continue with the study or withdraw? Do you feel able to keep yourself safe from harming yourself? If they indicate any issues remind withdraw?"

- If during research the participant has disclosed a **clear risk of suicidality** (for instance, a description of plans for self-harming, or explaining that they are in possession of medication to take an overdose), the researcher will explain the need to communicate this to healthcare professionals:

"You've spoken about wanting to take an overdose with some medication you have, and it sounds like you are quite upset about some of the things we've been talking about. What I'm going to do, like we'd talked about at the beginning, is to speak with your care coordinator and tell them how you are feeling so that they know what's going on for you and so that they can help you"

- If any risk of suicidality has been disclosed by a participant during the research and this **risk needs to be reported to health care professionals**, the researcher will do so verbally and also confirm this in writing
- The researcher will keep anonymised notes summarising contacts relevant to risk, including dates and actions taken. These notes will be stored in a locked cabinet in a locked office at the University of Manchester, in accordance with the university's data management procedures.

PART 3: Minimising risk to researcher

Why? Where possible, participants will be briefed and debriefed at a community location or the University. However, if these options are not suitable, then the briefing interview, and debriefing sessions may be conducted at the participant's home. Working within the community presents additional risk to the researcher. These have been assessed and are addressed within the lone worker risk assessment. Furthermore, the researcher is experienced in lone working within the community and will adhere to the University of Manchester's lone worker policy and specific measures to minimise risk as specified within the risk assessment.