Sleep-Related Thought Processes in Young People and the Impact of Non-Pharmacological Sleep Interventions on Anxiety Symptoms

Alex Catherine Staines *(Trainee Clinical Psychologist)*

Primary Supervisor: Dr Laura Pass

Secondary Supervisor: Professor Niall Broomfield

Thesis submitted in partial fulfilment of the degree of

Doctorate in Clinical Psychology

Faculty of Medicine and Health Sciences

University of East Anglia

Submission Date: 2nd March 2021

Thesis portfolio wordcount: 33,241 (excluding appendices)

Candidate registration number: ZCQ18UNU

Thesis Portfolio Abstract

Aims: The meta-analysis in this thesis portfolio aimed to investigate whether non-pharmacological interventions aimed at improving sleep change anxiety symptoms, and sleep-related thought processes, immediately post-intervention. The empirical research project aimed to (1) explore associations between sleep and sleep-related thought processes in adolescents, (2) assess the feasibility of implementing a brief sleep intervention in schools.

Methods: A meta-analysis statistically synthesised effect sizes of all Randomised Control Trials (RCTs) which reported anxiety symptoms in a random-effects model. A secondary meta-analysis was conducted which included studies that reported a measure of sleep-related thought processes. Subgroup analyses were conducted for participants with physical and mental health difficulties. For the empirical project, correlational analyses explored associations between sleep and sleep-related thought processes in a sample of adolescents.

Results: Forty-three RCTs (n = 5945) were included in a random-effects meta-analysis. The combined effect size of non-pharmacological sleep interventions on anxiety symptoms was moderate (g = -0.38, 95% CI -0.30 to -0.47). Subgroup analyses found moderate effects for participants with additional physical health difficulties (g = -0.46, 95% CI -0.29 to -0.63) and for participants with additional mental health difficulties (g = -0.47, 95% CI -0.34 to -0.60). A secondary meta-analysis found a large effect of non-pharmacological sleep interventions on sleep related thought processes (g = -0.92, 95% CI -0.59 to -1.25). The empirical project found associations between adolescent subjective insomnia severity, sleep quality and sleep-related thought processes. Given recruitment constraints, implementing the brief sleep intervention was not possible. However, preliminary feasibility data indicated 51% of the sample (n = 65) reported they would like help for their sleep.

Conclusions: The meta-analysis suggests despite not targeting anxiety directly, non-pharmacological sleep interventions can improve anxiety symptoms. Sleep-related thought processes also improve. The empirical project suggests sleep-related thought processes may be related to increased insomnia severity in adolescents.

List of Contents

List of Tables

List of Figures

Acknowledgements

I would firstly like to thank my research supervisors, Dr Laura Pass, and Professor Niall Broomfield. Your encouragement, support, and guidance has been so appreciated. I have really valued the optimism maintained throughout a challenging year in the context of the COVID-19 pandemic. I would also like to thank Dr Faith Orchard for all the support, especially the helpful feedback, and Jess Bridges, your help was immensely appreciated, and I valued our regular teams chats. I would like to thank the schools who took part in our research, both students and teachers. I valued the sheer enthusiasm and passion the teachers have for supporting their students.

Thanks to my fantastic fellow trainee psychology colleagues. I feel grateful to have been part of a lovely cohort and have made some very special friendships. I would particularly like to thank Hannah Cowie. We have worked as a great team and supported one another well throughout this challenging year.

I would like to thank all my friends outside of the psychology field who have always been so supportive. Thank you to my lovely Shaun, for being by my side every step of the way. Finally, I would like to thank my wonderful Mum for always being my cheerleader. Your non-judgement, sense of humour and compassion has supported me throughout my journey to clinical psychology.

Chapter 1. Introductory Chapter

This introductory chapter aims to provide background information on the core concepts within the portfolio and provides a rationale for the meta-analysis and empirical research project.

'Insomnia' is described by the Diagnostic & Statistical Manual of Mental Disorders (DSM-V; the handbook used to guide the diagnosis of mental health disorders) as dissatisfaction with sleep quality or quantity for more than three months, including difficulty falling or staying asleep, or waking early and not being able to return to sleep (American Psychiatric Association, 2013). The impact of insomnia in adults can be detrimental with research indicating worse health-related quality of life (Katz & McHorney, 2002), increased risk of accidents (Leger et al., 2014), reduced work productivity (Daley et al., 2019), and restricted activity due to illness and days spent in bed (Simon & VonKorff, 1997). Insomnia is common for both adults and adolescents, and often presents comorbidly with additional mental health difficulties, particularly anxiety and depression (Roth, 2007). Population-based research has found 40% of individuals diagnosed with insomnia have a comorbid psychiatric disorder, compared with 16.4% of those with no sleep complaints (Ford & Kamerow, 1989).

From a theoretical perspective, there have been cognitive, behavioural, neurobiological and hyperarousal models of insomnia proposed. Firstly, an early behavioural model of insomnia by Spielman and colleagues (The Three-Factor Model) suggests there are three interacting factors (predisposing, precipitating, and perpetuating) which contribute to the development and maintenance of insomnia (Spielman, Caruso & Glovinsky, 1987). Predisposing factors refer to a range of biopsychosocial constructs which may increase a person's vulnerability to the development of insomnia. Precipitating factors refer to the primary triggers for the initial sleep disturbance which are often related to stressful life events (including physical and mental health difficulties). Perpetuating

factors refer to the behaviours a person adopts to compensate or cope with sleeplessness (Spielman, Caruso & Glovinsky, 1987). A particular perpetuating behaviour which is often targeted with 'Sleep Restriction' (a component of Cognitive Behavioural Therapy for Insomnia; CBT-I) is excessive amounts of time spent in bed (Spielman, Saskin & Thorpy, 1987). More recent research has investigated other perpetuating factors involved in insomnia. For instance, Broomfield and Espie (2005) conceptualised a construct coined 'sleep effort'. 'Sleep effort' is described as comprising both cognitive and behavioural elements. The emergence of this construct arose after findings indicated adults with insomnia often make significant attempts to control their sleep (Broomfield & Espie, 2005). Given sleep is an involuntary process, considerable efforts to control sleep may have the paradoxical effect, and in turn maintains insomnia (Broomfield & Espie, 2005). There has been initial objective evidence using actigraphy measurement to suggest Paradoxical Intention therapy (an empirically supported treatment for insomnia) reduces sleep effort and improves sleep in adults with insomnia (Broomfield & Espie, 2002). Sleep effort remains under-researched, and there have been no studies which have explored the construct in an adolescent population. The empirical research project within this thesis portfolio aimed to contribute to this gap in the literature.

Secondly, Harvey's (2002) Cognitive Model of Insomnia suggests individuals who suffer from insomnia are often overly worried or preoccupied about their sleep. This preoccupation can lead to heightened anxiety, counterproductive safety behaviours (such as implementing thought control strategies), and dysfunctional beliefs about sleep arise (Harvey, 2002). This in turn maintains a vicious cycle of insomnia. There are several validated measures available which capture some of these sleep-related thought processes, including the Dysfunctional Beliefs and Attitudes About Sleep Scale (Morin et al., 2007) and the Sleep Anticipatory Anxiety Scale (Bootzin et al., 1994). However, there remains little investigation into the impact of sleep interventions such as CBT-I and Paradoxical

Intention Therapy on these sleep-related thought processes in both adults and adolescents. The meta-analysis and empirical research project presented within this thesis portfolio aimed to address this gap in the literature.

Research has found a bidirectional relationship between insomnia and anxiety where insomnia can precede anxiety, and vice versa (Roth, 2007). This is not surprising given models of insomnia suggest some processes related to anxiety (such as worry) can contribute to the development and maintenance of insomnia (Harvey, 2002). This has important clinical implications when considering treatments. Emerging research has explored the indirect effects of sleep targeted interventions on depression and anxiety symptoms. A recent meta-analysis exploring non-pharmacological interventions for sleep on depression symptoms found these interventions significantly reduced symptoms of depression immediately post-intervention (Gee et al., 2019). There has been similar preliminary research investigating the indirect effects of CBT-I on anxiety, worry and stress (Belleville et al., 2011). However, more research is warranted, particularly in exploring the impact of non-pharmacological sleep interventions (not just limited to CBT-I) on anxiety and sleep-related thought processes. This could add to the literature both theoretically and clinically by understanding further the relationship between anxiety, sleep-related thought processes and insomnia, and providing possible clinical implications such as considerations for screening measures and therapy. Exploration of the impacts of sleep interventions on anxiety symptoms are also needed for individuals who have additional physical and mental health difficulties. The meta-analysis presented within this thesis portfolio aimed to address this gap in the literature.

Insomnia in adolescence (young people between the ages of 10-19; World Health Organisation, 2015) remains under researched despite being a common problem in this age range. In a sample of 1014 US (United States) adolescents (13 to 16 years of age), 10.7% met DSM-IV criteria for insomnia, and of those with insomnia, 52.8% had a comorbid

psychiatric disorder (Johnson et al., 2006). Recent prevalence research has shown adolescents often suffer from poor sleep quality, with 65% of adolescents reporting the time it takes to get to sleep at night takes longer than 30 minutes (Hysing et al., 2016), more than half of teens report the need for more sleep (Wolfson & Carskadon, 1998), and most (59%) wake feeling unrefreshed at least a few times per week (Gradisar et al., 2013).

The impact of poor sleep in adolescence can be significant. Poor sleep for adolescents has been linked with attendance issues, poor school performance, inattention, skipping lessons, learning and memory difficulties, poor academic grades, behavioural problems, and difficulties with emotional regulation (Biggs et al., 2011; Fuligni & Hardway, 2006; Pasch et al., 2010).

Recent evidence suggests that sleep problems, particularly wakefulness in bed *precedes* the development of anxiety and depression in adolescents (Lovato & Gradisar, 2014; McMakin & Alfano 2015). Wakefulness in bed is a key indicator of mental health problems in adolescents (Blake et al., 2018) and of current and future internalising problems (Alfano et al., 2010; Lovato & Gradisar, 2014; McMakin & Alfano, 2015). Current adolescent sleep studies frequently neglect measuring sleep-related thought processes which occur during the pre-sleep period, despite adult research indicating these are involved in both the development and maintenance of insomnia. Thus, more research is needed to understand the processes involved in the development and maintenance of insomnia in the adolescent population. The empirical research project within this thesis portfolio aimed to contribute to this gap in the literature by understanding some of the possible associations between sleep-related thought processes (including sleep effort, dysfunctional beliefs and attitudes about sleep and sleep anticipatory anxiety) and subjective insomnia severity and sleep quality in adolescents.

National Institute of Clinical Excellence (NICE) recommends ‘cognitive and behavioural interventions’ alongside good sleep hygiene and exercise, for those aged 16

and over who have experienced insomnia for greater than four weeks (NICE, 2015). In the adult literature, research has indicated the efficacy of CBT-I (Riemann et al., 2017). Regarding adolescents, a recent meta-analysis by Blake and colleagues (2017) explored the efficacy of CBT-I in adolescents. This research found improvements in depression, anxiety and daytime sleepiness post-intervention, and sleep diary and actigraphy data showed improvements in total sleep time, sleep efficiency and sleep onset latency. However, the studies were critiqued for a lack of follow ups, lack of measurement of co-related mental health difficulties and lack of family involvement. This research identified a need for future research to develop sleep-based interventions for adolescents, targeting community samples (Blake et al., 2017). The empirical research project aimed to contribute to this gap in the literature by investigating the feasibility of implementing a brief sleep-based intervention in schools. Parental involvement, and measurement of co-related mental health difficulties and processes involved in the maintenance of sleep pre-post intervention were planned to be implemented.

Importantly to consider, adolescents are restricted by early school start times, and research is consistently indicating school start times should commence later in the day (Boergers et al., 2014; Kirby et al., 2011; Wheaton et al., 2016). This is primarily due to a misalignment between an adolescents' natural tendency to have an 'evening-ness' chronotype and restricted social schedules such as school. Chronotypes refer to individual differences in the timing of the circadian rhythm (an internal clock which regulates the sleep-wake cycle), with some people naturally preferring to fall asleep and wake early ('morning-ness'), and others preferring to fall asleep and wake late ('evening-ness'; Horne & Östberg, 1976). Given most adolescents naturally prefer waking late and rising late (Roenneberg et al., 2004), this can significantly impact their ability to adjust to early school start times. Additionally, research has found individuals with an 'evening-ness' preference have lower quality sleep (Russo et al., 2017) and more emotional and

behavioural problems (Gariepy et al., 2018) than those with a 'morning-ness' preference. What is more, as adolescents enter puberty, their circadian rhythm naturally shifts to slightly later in the day (Carskadon, 2011). These biological and societal pressures can lead to a 'Perfect Storm' (Carskadon, 2011), and the consequences may include poorer mental health, ill-timed sleep, and poorer school performance (Zerbini et al., 2017). Therefore, capturing an adolescents chronotype is important when considering sleep intervention research. The empirical project presented within this portfolio aimed to consider the impact of chronotype and make adaptions to any intervention offered, as necessary.

This thesis portfolio consists of a meta-analysis and empirical project exploring (1) non-pharmacological sleep interventions and anxiety symptoms, and (2) relationships between different sleep and sleep-related thought processes in an adolescent sample. Chapter 2 presents a meta-analysis written for publication to *Journal of Sleep Research,* which investigates the impact of non-pharmacological sleep interventions on anxiety symptoms and sleep-related thought processes immediately post-intervention. The meta-analysis had two primary research questions: 1) Do non-pharmacological sleep interventions aimed at improving sleep change anxiety symptoms? 2) Do non-pharmacological sleep interventions aimed at improving sleep change sleep-related thought processes? To address the first research question, a meta-analysis was conducted to statistically synthesise effect sizes of all Randomised Controlled Trials (RCTs) of non-pharmacological sleep interventions which used anxiety as a primary or secondary outcome measure. Additional subgroup analyses were performed to explore the impact on participants with additional physical and mental health difficulties. To address the second research question, a secondary meta-analysis was conducted to statistically synthesise effect sizes of studies which had reported a sleep-related thought process measure as a primary or secondary outcome. Chapter 3 provides information of how the meta-analysis and empirical research project are linked together.

Chapter 4 presents an empirical research project written for publication to *Journal of Sleep Research* which investigates the relationships between different sleep and sleep-related thought process variables within an adolescent sample. This project was intended to be a two-part study undertaken jointly with a fellow trainee clinical psychologist (HC, second author in Chapter 4). This second part intended to explore the feasibility of implementing a brief-sleep intervention in schools. Recruitment for the empirical research project was therefore conducted jointly. However, the two projects collected different measures from the same sample, thus producing two substantial empirical projects. Given several recruitment constraints, the intervention part of the empirical project was not possible. Further discussion of these challenges is presented in Chapter 6, along with the planned full procedure and additional ethical considerations. An extended methodology and additional results for both the meta-analysis and empirical research project can be found in Chapter 5. Preliminary feasibility data for the empirical project is presented in Chapter 7.

The final chapter of the portfolio integrates the findings from both the meta-analysis and empirical research project. A discussion on how these findings link to wider psychological theory, clinical implications of the research and a critical appraisal of the work undertaken is presented. Clinical implications and suggestions for future research have been discussed throughout the thesis portfolio. Appendices can be located at the end of the portfolio. Three reference lists are presented: 1) meta-analysis references 2) empirical research project references 3) references from all other chapters.

Additional Terminology

‘Sleep-related thought processes’ is a broad term used throughout the thesis portfolio that refers to primarily cognitive maintenance factors involved in insomnia. This includes dysfunctional beliefs and attitudes about sleep, sleep anticipatory anxiety (which

also has somatic components) and sleep effort (a multi-component cognitive and behavioural construct).

'Non-pharmacological sleep interventions' refer to any sleep intervention which does not have a pharmacological component. This includes evidence-based psychological treatments, third-wave psychological treatments and any other non-psychological approaches specifically aimed at improving sleep.

'CBT-I' or cognitive behavioural therapy for insomnia is the first-line NICE recommended treatment for insomnia for those aged 16 and over who have experienced insomnia for greater than four weeks (NICE, 2015).

'Sleep Efficiency' is commonly defined as the ratio of total sleep time (TST) to time in bed (TIB; Reed & Sacco, 2016). Sleep efficiency is often calculated by working out a person's average total sleep time divided by the amount of time spent in bed. This is then multiplied by 100 to provide a percentage of how much time is spent in bed, asleep. This data is usually provided through subjective sleep diary entries.

'Sleep Latency' or 'Sleep Onset Latency' refers to the amount of time it takes to fall asleep.

'Actigraphy' is a non-invasive method of monitoring human rest/activity cycles. It is commonly used in sleep research to measure sleep patterns.

Chapter 2. Meta-analysis

Do Non-Pharmacological Sleep Interventions Affect Anxiety Symptoms? A Meta-Analysis.

Written for publication to *Journal of Sleep Research*

(Author guidelines for manuscript preparation – Appendix A)

Alex Staines*[1], Dr Faith Orchard[2], Professor Niall Broomfield[1], Jessica Bridges[1], Dr Laura Pass[1]

[1]Department of Clinical Psychology, Norwich Medical School, University of East Anglia

[2]School of Psychology, University of Sussex, UK

Author Note

*Correspondence concerning this article should be addressed to Alex Staines, Department of Clinical Psychology, Norwich Medical School, University of East Anglia, Norwich Research Park, Norwich, Norfolk, NR4 7TJ, ENGLAND, UNITED KINGDOM.

Email: a.staines@uea.ac.uk

Word count: 6526

Reference count: 103

Conflicts of interest: None.

Abstract

Research indicates a bidirectional relationship between sleep and anxiety with findings suggesting anxiety can precede poor sleep and vice versa. Evidence suggests sleep-related thought processes associated with anxiety are involved in the maintenance of insomnia. Previous meta-analyses provide some evidence to suggest Cognitive Behavioural Therapy for Insomnia (CBT-I) moderately improves anxiety, yet little research has investigated the effect of other sleep interventions on anxiety symptoms. The aim of this meta-analysis was to review whether non-pharmacological sleep interventions have an impact on anxiety symptoms immediately post-intervention. A systematic search of electronic databases was conducted to identify all Randomised Control Trials (RCTs) investigating non-pharmacological sleep interventions which included anxiety symptoms as an outcome. Forty-three RCTs (n = 5945) met full inclusion criteria and were included in a random-effects meta-analysis model. The combined effect size of non-pharmacological sleep interventions on anxiety symptoms was moderate (hedges *g* = -0.38, 95% CI -0.30 to -0.47) indicating a reduction in symptoms. Subgroup analyses found a moderate effect for those with additional physical health difficulties (*g* = -0.46, 95% CI -0.29 to -0.63) and a moderate effect for those with additional mental health difficulties (*g* = -0.47, 95% CI -0.34 to -0.60). A secondary meta-analysis found a large effect of non-pharmacological sleep interventions on sleep-related thought processes (*g* = -0.92, 95% CI -0.59 to -1.25). These findings indicate non-pharmacological sleep interventions are effective in reducing anxiety and sleep-related thought processes. This has potential clinical implications for considering sleep interventions in the treatment of anxiety.

Keywords. Adults, Cognition, Mood, Mental Health, Treatment Effectiveness

Introduction

Anxiety disorders are amongst the most common mental health problems with research from a large European population-based survey indicating a lifetime prevalence of 16.6% (Somers et al., 2006). In addition, findings from primary care in the United Kingdom (UK) have reported a point prevalence rate of 7.2%, with a higher prevalence found in females and young adults (aged 20-29 years; Martín-Merino et al., 2010). Sleeping difficulties are also a common problem with research indicating around one third of adults in Western countries experience sleep problems at least once a week, and between 6-10% fulfil the criteria for insomnia disorder (Morphy et al., 2007). Research has shown that the prevalence of insomnia is 1.5–2 times higher in females than males (Wilson et al., 2019) and is most common in older adults (Alberta Medical Association, 2015; McCall, 2004). What is more, research has found high rates of insomnia comorbid with anxiety disorders. For instance, in a large Nationally representative cross-sectional survey study, it was found respondents with comorbid mood and anxiety disorders had significantly higher rates of severe insomnia complaints (42.1-62.8%; Soehner & Harvey, 2012). Moreover, severe insomnia complaints were significantly more prevalent in individuals with anxiety disorders (24.9-45.5%) relative to those with no disorder (12.4-24.3%; Soehner & Harvey). These findings demonstrate anxiety and insomnia often co-occur.

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), anxiety disorders include separation anxiety disorder, selective mutism, specific phobia, agoraphobia, social anxiety disorder, panic disorder, generalised anxiety disorder, substance-induced anxiety, and anxiety disorder due to another medical condition (American Psychiatric Association, 2013). National Institute of Clinical Excellence (NICE) recommends evidence-based psychological interventions in the treatment of anxiety disorders, usually Cognitive Behavioural Therapy (CBT) as the first-line approach for both adults and children (NICE, 2014). Meta-analyses of CBT for anxiety have

reported varying effect sizes. One review explored the efficacy of a CBT intervention for anxiety, on anxiety symptoms relative to treatment as usual (TAU) and found the pooled effect size was in the moderate to high range (Watts et al., 2015). Another review found CBT for anxiety had moderate placebo-controlled effects on target disorder symptoms and small to moderate effects on other anxiety symptoms (Carpenter et al., 2018). However, in a previous meta-analysis which investigated the efficacy of anxiety-based psychotherapeutic interventions for Generalised Anxiety Disorder (GAD) in the older adult (>55) population, only a small effect was found (Goncalves & Byrne, 2012). Results from these reviews do not indicate whether sleep was targeted in the treatment of anxiety.

Current literature in both adult and child populations indicate a bidirectional relationship between sleep problems and emotional difficulties such as stress and anxiety. A longitudinal study investigating a large sample of 1057 children (aged 4.5-10.5 years) found preschool sleep problems directly predicted 'anxious-depressed' symptoms two years later, and indirect effects continued into preadolescence (Foley & Weinraub, 2017). Similarly, research in the adolescent population has found that sleep problems, particularly wakefulness in bed at night, *precedes* the development of anxiety and depression (Lovato & Gradisar, 2014; McMakin & Alfano, 2015). Longitudinal adult research has found anxiety symptomology can be both a predisposing and precipitating factor for the onset of insomnia (LeBlanc et al., 2009). This has important implications when considering treatment for individuals experiencing anxiety and sleep problems.

Meta-analyses have provided preliminary evidence to suggest there may also be a bidirectional relationship in the treatment of insomnia and anxiety. One meta-analysis exploring the impact of CBT for anxiety disorders on comorbid sleep disturbance found a moderate effect (pooled effect size: 0.53; Belleville et al., 2010). Conversely, one previous meta-analysis has shown a moderate effect (pooled effect size: 0.41) of CBT-I (Cognitive Behavioural Therapy for Insomnia) on concomitant anxiety, arousal, worry, and stress (Belleville et al., 2011). However, this research (1) did not consider additional non-

pharmacological sleep interventions other than CBT-I, (2) was not limited to "gold standard" Randomised Control Trials (RCT's), (3) included measures of both anxiety and co-related anxiety processes such as worry or stress and (4) included studies with combined anxiety and sleep interventions. This makes it difficult to draw firm conclusions about mechanisms contributing to post-treatment change. Therefore, the extent to which anxiety symptoms indirectly improve after non-pharmacological (non-anxiety focused) sleep interventions warrant further investigation.

Research in depression symptomology has similarly shown a bidirectional relationship with insomnia (Alvaro et al., 2013). Interestingly, meta-analyses have found evidence to suggest non-pharmacological interventions aimed at improving sleep can indirectly lead to improvements in depression symptoms, with a particularly elevated effect found in the mental health population (Gee et al., 2019). Less is known about the indirect effects of non-pharmacological sleep interventions on anxiety symptoms for those with additional mental health difficulties.

Previous meta-analyses have found strong evidence to suggest physical health difficulties such as cancer, diabetes, and multiple sclerosis are highly comorbid with anxiety symptoms (Nikbakhsh et al., 2014; Janzen Claude et al., 2014; Boeschoten et al., 2017). Additionally, correlational research has found a positive relationship between insomnia severity and chronic back pain (Tang et al., 2007) and multiple sclerosis (Bamer et al., 2008). Moreover, research has found in newly diagnosed cancer patients, the estimated prevalence of insomnia was between 30-50% (Savard & Morin, 2001). Treating insomnia early in this population is important, to prevent this becoming a chronic problem given research has shown that several years after cancer treatment, 23-44% of cancer survivors still experience insomnia (Savard et al., 2001; Savard et al., 2005). Notably, these findings highlight the importance for research to provide evidence for appropriate treatments for sleep disturbance and anxiety for those with a range of physical health difficulties.

Emerging evidence suggests there may be an interaction between insomnia and anxiety in individuals experiencing physical health difficulties. A large population-based study exploring the prevalence and predictors of insomnia in women with ovarian cancer found 17% of women reported clinically significant insomnia and elevated anxiety was a key predictor (Price et al., 2009). Recommendations for future research from this study suggested exploring the efficacy of interventions targeting insomnia and anxiety within this population (Price et al., 2009). There have been no meta-analyses investigating the effect of non-pharmacological sleep interventions on anxiety symptoms for those with additional physical health problems.

From a theoretical perspective, cognitive models of insomnia have proposed that sleep-related thought mechanisms associated with anxiety play a key role in the development and maintenance of sleep problems. Harvey's (2002) 'Cognitive Model of Insomnia' proposes that excessive worry and preoccupation about the impact sleep disturbance may have on health or daytime functioning triggers a physiological anxiety response. The model suggests the combination of an increased cognitive (e.g., attending to sleep-related threats, rumination, dysfunctional beliefs about sleep) and physiological (e.g., increased heart rate, sweating) anxiety response prevents the onset of sleep. This for some can then persist into a vicious cycle and can lead to chronic insomnia (Harvey, 2002; Harvey, 2005). Additionally, the Attention-Intention Effort model (Espie et al., 2006) suggests after a period of acute insomnia, unhelpful beliefs about sleep arise (e.g., "I can never sleep again"), leading to anxiety or preoccupation about sleep and its consequences, which leads to worry about going to sleep and direct attempts to control sleep.

There are several widely used validated questionnaire tools which measure sleep-related thought processes that are involved in the maintenance of insomnia, and map onto cognitive models of insomnia (Harvey, 2002; Espie et al., 2006). This includes the Dysfunctional Beliefs about Sleep Scale (Morin et al., 1993) and the Pre-Sleep Arousal scale (Nicassio et al., 1985) which has a particular cognitive component. These

questionnaires are sometimes used in studies exploring the efficacy of sleep interventions on insomnia. Recent meta-analyses have investigated the impact of CBT-I on certain pre-sleep thoughts involved in the maintenance of insomnia. For instance, a meta-analysis by Thakral et al. (2020) found dysfunctional beliefs and attitudes about sleep improve after a period of CBT-I in adults, with a large effect reported. There have been no meta-analyses exploring the impact of other non-pharmacological sleep interventions on sleep-related thought processes including other processes such as sleep anticipatory anxiety, and sleep effort.

The mechanisms underlying the maintenance of insomnia have important relevance for the type of intervention offered within mental health services. The current first-line NICE-recommended non-pharmacological treatment for adults with chronic insomnia (>3 months) is Cognitive Behavioural Therapy for Insomnia (CBT-I; NICE, 2020). CBT-I typically includes behavioural components including stimulus control and sleep restriction, as well as cognitive components including cognitive restructuring with a focus on challenging dysfunctional beliefs about sleep and worries or preoccupation about sleep. Advice on sleep hygiene is recommended for both chronic and mild insomnia, and the guidelines advise to treat comorbid mental health difficulties as required (NICE, 2020). NICE-recommended therapy for anxiety treatment tends not to incorporate strategies to improve sleep problems (e.g., CBT for Anxiety manuals; Lenz, 2018) despite research highlighting high rates of comorbidity. This poses potential intervention dilemmas for clinicians when patients present with anxiety and comorbid sleep disturbance.

Aims

Aim 1. Anxiety Symptoms

The present review aimed to investigate whether non-pharmacological sleep interventions change anxiety symptoms. The review systematically identified and synthesised all relevant RCTs of non-pharmacological sleep interventions which reported anxiety symptoms as either a primary or secondary research outcome. The impact of sleep

interventions on anxiety symptoms for individuals with additional physical health problems has not been explored. Therefore, this review sought to address this gap by conducting a subgroup analysis exploring whether sleep interventions change anxiety symptoms for individuals with additional physical health problems. The review also planned a subgroup analysis on participants with mental health problems, given past meta-analyses have found slightly elevated effects in this population (Gee et al., 2019; Belleville et al., 2011).

Aim 2. Sleep-Related Thought Processes

Cognitive models of insomnia suggest there are certain sleep-related thought processes often associated with anxiety that can maintain insomnia. Research has not investigated the impact of non-pharmacological sleep interventions on these processes. The present review therefore also aimed to investigate whether non-pharmacological sleep interventions change sleep-related thought processes.

Research Questions

1. Do non-pharmacological sleep interventions aimed at improving sleep change anxiety symptoms?
    a. Do non-pharmacological sleep interventions aimed at improving sleep change anxiety symptoms for individuals with additional physical health difficulties?
    b. Do non-pharmacological sleep interventions aimed at improving sleep change anxiety symptoms for individuals with additional mental health difficulties?
2. Do non-pharmacological sleep interventions aimed at improving sleep change sleep-related thought processes?

Methods

Search Strategy and Inclusion Process

This systematic review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist and flow diagram for conducting and reporting systematic reviews (Moher et al., 2009). Details of the protocol for this

systematic review were registered on PROSPERO and can be accessed at: https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=205499

Five electronic databases were systematically searched from inception up to 21st January 2021: Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsychINFO, MEDLINE (plus PubMed), Cochrane Central Register of Controlled Trials (CENTRAL) and EMBASE. These databases were chosen as they were relevant to mental health, psychology, interventions, and sleep. A sensitive search strategy for each individual database was developed, using keywords and MeSH terms with Boolean operators. The following search terms were used: (sleep* OR insomnia OR "sleep disorder*") AND (non-pharmacological OR intervention* OR treatment* OR "Cognitive Behavioural Therap*" OR CBT* OR Education OR hygiene) AND (anx* OR GAD OR GAD-7).

The inclusion criteria were: 1) Randomised Control Trials (including studies which used any control condition including any other treatment, no treatment, treatment as usual and waiting-list control) 2) Anxiety symptoms or disorders (reported as a primary or secondary outcome) were measured using; a validated instrument; a diagnostic tool for DSM-5 or ICD-10 mental health disorder; a validated assessment measure, and obtained at immediate post-intervention 3) Human participants of any age, including those in the general population, those receiving treatment for mental health care and those receiving treatment for physical health difficulties 4) The intervention must include a non-pharmacological intervention aimed at improving sleep 5) The intervention can be delivered in any form 6) The intervention can be delivered by any person 7) For Aim 2 'sleep related thought processes' as measured by the following questionnaires which have been cited in a previous meta-analysis to capture 'pre-sleep thoughts' (Lemyre et al., 2020): Night-time Thoughts Questionnaire, Self-statement Test, Glasgow Content of Thoughts Inventory, Insomnia Worry Questionnaire, Bedtime Counterfactual Processing Questionnaire, Nocturnal Regret Questionnaire, Pre-Sleep Arousal Scale (cognitive

subscale), Sleep Disturbance Questionnaire (three items), Thought Control Questionnaire (cognitive subscale), Sleep Associated Monitoring Index (pre-sleep questions). Questionnaires capturing other sleep-related thought processes will also be included: Dysfunctional Beliefs About Sleep Scale, Glasgow Sleep Effort Scale, Sleep Anticipatory Anxiety Questionnaire 8) The article was reported in the English language and in a peer-reviewed journal.

The exclusion criteria were: 1) The trial intervention included a pharmacological treatment (including herbal remedies) 2) The trial intervention was not directly aimed at improving sleep (e.g., CBT for anxiety/depression, acupuncture, yoga, stimulus control for worry) 3) The trial control condition was specifically designed to improve sleep (for instance a pharmacological sleep aid or sleep hygiene) 4) Any studies which used sleep devices such as Continuous Positive Airway Pressure (CPAP) 5) Non-experimental designs (e.g., pre-post within subjects designs / AB designs) 6) Studies which provided qualitative data only 7) RCT protocols 7) Non-pharmacological interventions for other sleep-related problems including chronic fatigue, night-eating syndrome, nightmare disorders, narcolepsy, sleep apnoea, ‘excessive daytime somnolence’ 8) The anxiety outcome measure did not explicitly measure anxiety symptoms (e.g. a measure of stress or worry). This was to limit the scope of the review to specifically focus on ‘anxiety symptoms’ as a construct, rather than additional separate components associated with anxiety such as stress or worry. Anxiety questionnaires measure both psychological and physiological components of anxiety whereas some scales pertaining to stress or worry primarily focus on the psychological/cognitive components (e.g., the Penn State Worry Questionnaire). This reflects other efficacy based meta-analyses involving anxiety symptoms (e.g., Carter et al., 2021) 9) Any study involving animal participants 10) The intervention was not a sleep-focused intervention in isolation (e.g., a combined CBT-I and anxiety intervention).

Study Selection

The process from study selection to extraction was followed in line with the PRISMA flowchart. Initial title and abstract screening were completed by one reviewer (AS) independently to establish eligibility for inclusion in this review. A random subset of abstracts (10%) retrieved were then screened by a second reviewer (JB) for concordance to be checked. If it was unclear from the title and abstract whether anxiety symptoms or sleep-related thought processes were measured as an outcome, the full text was searched. Duplicates were removed, then full texts were assessed for eligibility against the inclusion/exclusion criteria by two reviewers independently (AS and JB). Disagreements between reviewers were discussed and a consensus agreed, or if needed resolved by a third reviewer (LP). The reference lists of all identified eligible articles were searched for additional studies to ensure any relevant studies were not missed by the electronic search.

Data Extraction and Quality Assessment

Data from included studies were extracted by AS and cross-checked by JB. Authors were contacted if there was insufficient outcome data reported for conducting the meta-analysis. The methodological quality of studies included in this review were assessed by AS using the most recent Cochrane Risk of Bias tool for randomized trials (RoB2; Sterne et al., 2019). This tool is suitable for individually randomized, parallel-group trials. A second reviewer (JB) assessed a subset (20%) of the included studies using this tool. A discrepancy check was also conducted. Any disagreements were discussed, and a consensus agreed.

Data Synthesis

All eligible studies which included sufficient data on a validated anxiety outcome measure and numbers of participants in each condition were included in a random effects meta-analysis. A random effects model was selected for analyses as this does not assume

that each study included in the meta-analysis is identical, meaning each study can introduce its own underlying variance. This model is predominantly used in trials of mental health or social science (Cuijpers, 2016). The random effects meta-analysis was used to compare the effect sizes of interventions relative to control conditions, using the online meta-analysis tool Meta-Analysis via Shiny Version 1.1.2 or 'MAVIS' (Hamilton et al., 2016). Studies were weighted to calculate a combined effect size (Hedge's g). This software allowed for the examination of possible sources of heterogeneity using the I^2 statistic (Higgins et al., 2003). In general, it is assumed that a percentage of 25% indicates low heterogeneity, 50% moderate and 75% high heterogeneity (Higgins et al., 2003). A sensitivity analysis was planned to be conducted a priori where studies rated as low quality were removed from the overall meta-analysis. Four meta-analyses were conducted in MAVIS to address the aims of the study. This included:

1. Overall meta-analysis of the effect of sleep interventions on anxiety symptoms
    a. Sub-group analysis of studies involving participants with additional physical health difficulties
    b. Sub-group analysis of studies involving participants with additional mental health difficulties
2. Secondary meta-analysis of the effect of sleep interventions on sleep related thought processes

Relevant data required for the meta-analysis was extracted from the results section of the included studies. This included the number of participants, means (M), standard deviations (SD), effect size (ES) and standard error. Cohen's d effect sizes were used for analyses rather than M/SD, given some studies only reported ES. When not reported, a Cohen's d effect size was computed for each included study for data input into the random effects model. The effect size was calculated based on reported data available (mean, standard error and/or confidence intervals).

For studies with two sleep intervention conditions compared to a control condition (e.g., Cognitive Therapy, Behavioural Therapy and Wait List Control; Sunnhed et al., 2020), a hierarchy was developed to decide which intervention was included in the meta-analysis. In line with other similar meta-analyses (e.g., Gee et al., 2019), the intervention opted for was the 'most intensive' or which had a more robust evidence base. For example, as some research has indicated behavioural components of CBT-I are more effective than cognitive components (Blake et al., 2017), in a study which compared 'behavioural therapy', 'cognitive therapy' and 'Wait List Control', behavioural therapy was included in the meta-analysis. Similarly, face-to-face interventions were opted for over self-help interventions as they are more intensive and in meta-analyses have demonstrated higher efficacy (van Straten et al., 2018).

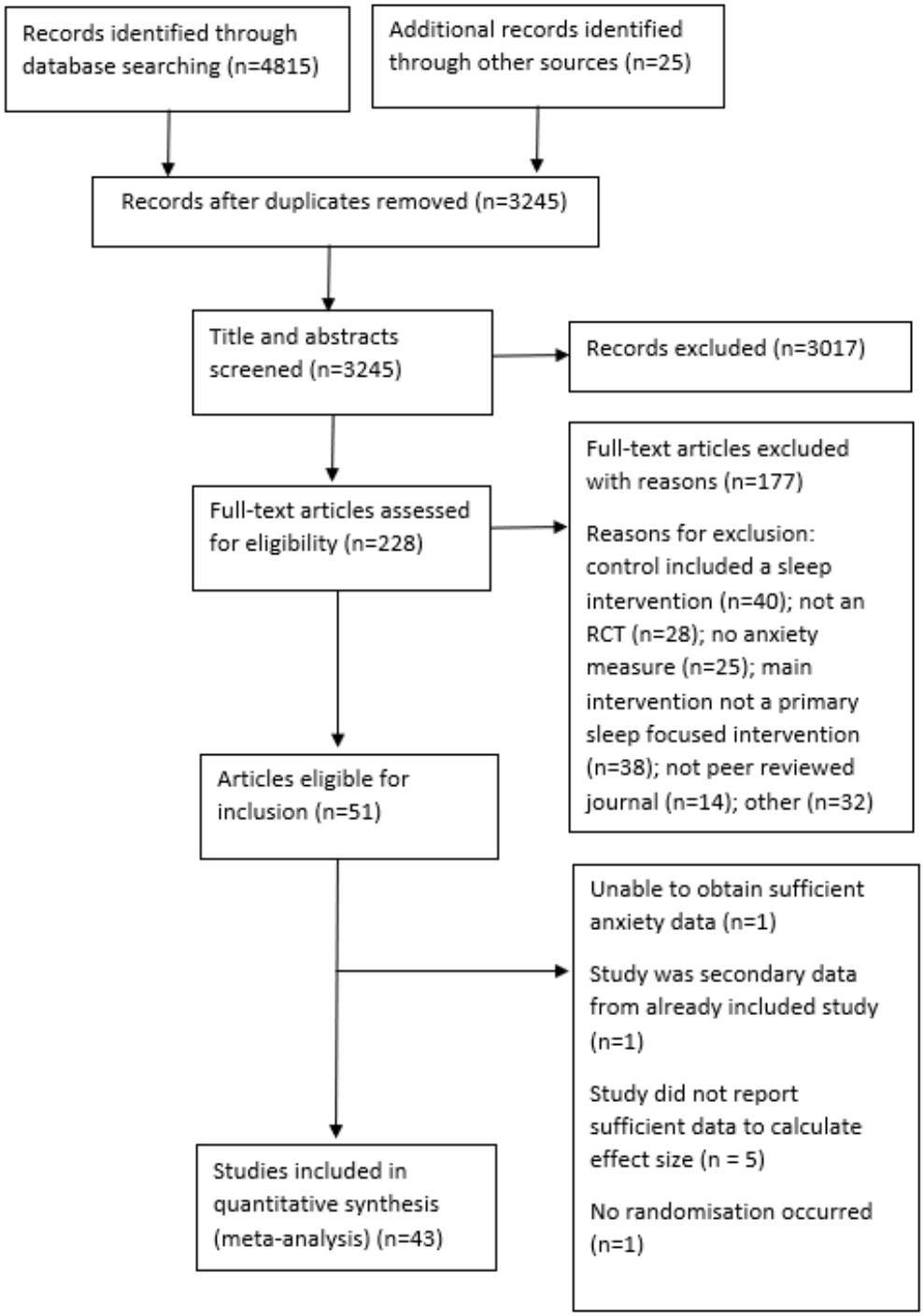
Results

Study Selection

A PRISMA flow-diagram shows the selection of papers for inclusion and exclusion (Figure 1). A total of 4840 articles were retrieved, of which 1595 were duplicates. There were 3017 articles excluded following title and abstract screening and 177 were excluded following the full text screen. During quality checking and data extraction, eight studies were excluded which meant 43 studies were included in the meta-analysis. Of the 43 included studies, eight had more than one intervention arm compared to a control. One study (Thorndike et al., 2013) included two participant groups; those in a 'low' depression group and those in a 'high' depression group as identified by the Beck Depression Inventory. The low depression group was included in the meta-analysis as most participants included in this review either had no reported mental health difficulties, had been excluded due to screening high for depression, or had subthreshold mental health difficulties.

Figure 1

PRISMA flow diagram of study selection process



Note. The full description of reasons for exclusion can be found in the appendices

Characteristics of Included Studies

Table 1 outlines the characteristics of included studies. In total, there were data on 5945 participants included in the meta-analysis, with data on 2741 for those receiving a non-pharmacological sleep intervention. Forty-two of the studies were psychological-based sleep interventions and one study used artificial bright light exposure as the sleep intervention (Huang et al., 2013). Most studies included (n=30) were described by the authors as primarily 'CBT-I'. Three studies were combined CBT-I interventions with additional third wave approaches incorporated which specifically focused on sleep. Three of the studies were behavioural-based interventions. Of the psychological-based studies (n = 42), 18 were delivered either via self-help (guided or self-directed) including use of an app or an online intervention. Twenty-four were delivered face-to-face either on a one-to-one basis with a trained professional or in a group format. One study's intervention was delivered by video conference. The control conditions included both active interventions (such as acupuncture or completing puzzles) and passive controls (such as waitlist control or treatment as usual conditions), all not specifically designed to improve sleep.

Most studies included adult participants, with only two studies focusing on young people under 18 years old (Blake et al., 2016; de Bruin et al., 2018) and three studies specifically focused on interventions with older adults (>65) (Black et al., 2015; McCrae et al., 2018; Rybarczyk et al., 2005). Most studies focused on individuals who were experiencing insomnia or sleep disturbance as identified by a validated screening tool or by assessment against classification systems for insomnia disorder. Eleven studies had participants who were experiencing sleep disturbance comorbid with additional physical health difficulties (4 = cancer, 1 = traumatic brain injury, 1 = chronic migraine, 1 = fibromyalgia, 1 = hearing difficulties, 1 = multiple sclerosis, 1 = heart failure, 1 = high blood pressure). Subjective sleep quality using a validated questionnaire, or a sleep diary was measured in 40 studies. Some studies (n=6) included inclusion criteria specifically

focusing on mental health difficulties, including depression, substance misuse disorder and stress. Most studies (n = 8) included in the sleep-related thought process secondary meta-analysis used the Dysfunctional Beliefs and Attitudes About Sleep (DBAS) scale. Where multiple measures regarding the same construct were reported, the most used measure across studies were selected.

Table 1

Characteristics of studies included in the meta-analysis (n=43)

Study	Country	Participants	Intervention	Control	Anxiety measure	Sleep measure
Barati & Amini, 2020	Iran	Adults with substance addiction admitted to treatment camps and those on methadone maintenance therapy	4 session sleep hygiene training (including sleep restriction)	Passive control	DASS Anxiety Subscale	PSQI
Batterham et al., 2017	Australia	Adults (18-64) with depression & insomnia	Online CBT-I (‘Shut-I’)	Healthwatch	GAD-7	ISI
Bergdahl et al., 2016	Sweden	Adults (18-75) meeting DSM-V criteria for insomnia disorder	CBT-I in a group format delivered by psychologists	Auricular acupuncture	HADS-A	ISI
Black et al., 2015	USA	Older adults (>55) with active sleep disturbance	Group sleep hygiene education	Mindfulness meditation	BAI	PSQI

Blake et al., 2016	USA	Secondary school students with insomnia symptoms	CBT-I + mindfulness sleep intervention (7 sessions)	No treatment control	SCAS	PSQI
Carney & Waters, 2006	USA	Undergraduate students with sleep onset difficulty	Constructive worry (focus is on pre-sleep worries)	Worry procedure (no intervention)	STAI-S	Sleep log (total sleep time)
Casualt et al., 2015	Canada	Adults with a diagnosis of non-metastatic cancer & acute insomnia symptoms	Self-help CBT-I with 3 brief phone consultations	WLC	HADS-A	ISI
Chapoutot et al., 2020	France	Adults with ICD-10 chronic insomnia and DSM-V sedative, hypnotic or anxiolytic use disorder	CBT/ACT sleep intervention (4 videoconference sessions delivered by psychologists)	WLC	QoL (anxiety)	ISI
De Bruin et al., 2018	The Netherlands	Adolescents (12-19) meeting DSM-5 criteria for insomnia	Group CBT-I	WLC	YSR	HSDQ – insomnia symptoms

Denis et al., 2020	UK	Females enrolled on a psychology degree with sub-threshold insomnia	Online CBT-I (‘Sleepio’)	Puzzle completion	STAI	PSQI
Espie et al., 2008	UK	Adults (>18) with breast, prostate, bowel or gynaecological cancer & chronic insomnia	CBT-I (based on Espie & Morin, 2003) delivered face-to-face by nurses (5 sessions)	TAU	HADS-A	Sleep diary
Espie et al., 2014	UK	Adults meeting DSM-V criteria for insomnia disorder	CBT-I online intervention with virtual therapist (6 weekly sessions)	TAU	DASS- Anxiety subscale	None
Freeman et al., 2017	UK	Adults (>18) attending university with positive screen for insomnia	Online CBT-I (‘Sleepio’)	TAU	GAD-7	SCI-8
Friedrich et al., 2018	Germany	Adults with insomnia disorder, nightmare disorder or irregular	Group manualised CBT-I and HT-I (6 sessions)	WLC	German version of (PHQ-D) -	None

		sleep-wake type (as per DSM-V)			anxiety (6 items)	
Gieselmann & Pietrowsky, 2019	Germany	Adults (>18) with insomnia disorder	Face-to-face psychotherapy for insomnia (4 weeks)	WLC	STAI-T	PSQI
Harris, Schiele & Emery, 2019	USA	Symptomatic heart failure patients (>18) with comorbid insomnia	BBT-I delivered over 4 weeks by graduate psychology students	Sleep monitoring	HADS-A	ISI
Ho et al., 2014	China	Adults (>18) with self-reported sleep difficulties	Self-help internet CBT-I based on Espie & Morin (2003)	WLC	HADS-A	ISI
Horsch et al., 2017	The Netherlands	Adults (>18) with insomnia disorder (DSM-V)	Mobile phone delivered CBT-I	WLC	HADS-A	ISI
Huang et al., 2013	China	Female hospital nurses on rotating shifts with ISI score >14	Exposed to artificial bright light for 10 days over a period of 2 weeks	No light exposure	HADS-A	ISI

Jansson-Fröjmark et al., 2012	Sweden	Adults with hearing difficulties and insomnia complaints	CBT-I delivered by trained psychologists (7 sessions)	WLC	HADS-A	ISI
Kyle et al., 2020	UK	Adults (>25) with DSM-5 insomnia disorder & difficulties with concentration or memory	Online CBT-I (‘Sleepio’)	WLC	GAD-2	ISI
Lancee et al., 2012	Germany	Adults (>18) with insomnia disorder (DSM-IV)	Electronic self-help CBT-I based on Espie & Morin (2003)	WLC	HADS-A	Insomnia SLEEP-50
Lancee et al., 2015	The Netherlands	Adults (>18) with insomnia according to DSM-V criteria	Online CBT-I based on Espie & Morin (2003)	WLC	HADS-A	ISI
Lancee et al., 2016	The Netherlands	Adults (>18) meeting DSM-V criteria for insomnia disorder	Face-to-face CBT-I	WLC	HADS-A	ISI
Lorenz et al., 2019	Germany	Adults (>18) with a minimum of 8 on the ISI	Online web-based unguided CBT-I with automated feedback	WLC	BSI (Anxiety subscale)	ISI

Matthews et al., 2014	USA	Women with breast cancer and chronic insomnia	CBT-I delivered by an advanced practice nurse	BPT	HADS-A	ISI
McCrae et al., 2018	USA	Older adults (>65) with chronic insomnia	Manualised (4 week) BBT-I delivered by predoctoral psychology students	Self-monitoring control	STAI-Y	Sleep diary
McCrae et al., 2019	Columbia	Adults (18+) with fibromyalgia and chronic insomnia	Manualised (8 session) CBT-I delivered by predoctoral ClinPsy students	WLC	STAI-Y	Sleep diary
McGrath et al., 2017	UK	Adults (>18) with mean blood pressure readings of 130–160 & mild sleep impairment	Online CBT-I (‘Sleepio’) with digital therapist (6-8 sessions)	No intervention	BAI	ISI
Mimeault & Morin., 1999	France	Adults (>18) with sleep-onset insomnia	Bibliotherapy with professional guidance	WLC	BAI	PSQI
Morris et al., 2016	UK	Undergraduate students experiencing stress	Unguided internet delivered "insomnia relief"	No intervention	STAI-S	PSQI

Nguyen et al., 2017	Australia	Adults with history of TBI and clinically significant sleep and/or fatigue complaints	CBT-I adapted for TBI delivered by neuropsychologists	TAU	HADS-A	PSQI
Ritterband et al., 2012	USA	Adults (>21) in remission from cancer and DSM-IV insomnia	CBT-I ('Shut-I') internet intervention	WLC	HADS-A	Sleep diary
Rybarczyk et al., 2005	USA	Adults with insomnia and geriatric depression symptoms	8 classroom sessions of CBT-I	WLC	BAI	PSQI
Siengsukon et al., 2020	USA	Adults (18-64) with multiple sclerosis, and insomnia symptoms	CBT-I (6 week) delivered by clinical psychologist	Active control	GAD-7	ISI
Smitherman et al., 2016	USA	Adults with chronic migraine and comorbid insomnia	CBT-I delivered by graduate-level therapists	'Sham Control'	GAD-7	PSQI
Sunnhed et al., 2020	Sweden	Adults with insomnia symptoms	Internet delivered BT (10 weeks)	WLC	HADS-A	ISI

Taylor et al., 2018	USA	Active-duty US army soldiers with persistent insomnia disorder	Face-to-face CBT-I (6 weeks) delivered by 'mental health professionals'*	Brief check in every other week	BAI	ISI
Thorndike et al., 2013	USA	Adults (18-65) with low depression and insomnia	CBT-I ('Shut-I') online intervention (6 intervention cores)	WLC	STPI-Trait Anxiety	None
van der Zweerde et al., 2019	The Netherlands	Adults (>18) with DSM-5 insomnia and depression symptoms	CBT-I ('i-Sleep') online intervention (5 sessions) based on Espie & Morin, 2003	No intervention	HADS-A	ISI
van der Zweerde et al., 2020	The Netherlands	Patients recruited from GP practices (≥18 years old) with clinical insomnia symptoms.	Nurse-guided I-CBT-I ('i-Sleep')	Care as usual	HADS-A	ISI
Xing et al., 2020	China	Adults meeting DSM-V criteria for insomnia	Group CBT-I	Electro-acupuncture	HAM-A	PSQI

Yeung et al., 2018	China	Adults (18-65) fulfilling DSM-5 criteria for insomnia	Group sleep hygiene education based on Harsora & Kessmann, 2009 & Espie & Morin, 2003	Self-administered acupressure	HADS-A	ISI

Note. Abbreviations: CBT-I = Cognitive Behavioural Therapy for Insomnia; Shut-I = an automated, interactive, internet based intervention based on CBT-I components; GAD-7 = Generalised Anxiety Disorder scale-7/2; ISI = Insomnia Severity Index; DSM = Diagnostic and Statistical Manual of Mental Disorders; HADS-A = Hospital Anxiety and Depression Scale-Anxiety subscale; BAI = Beck Anxiety Inventory; PSQI = Pittsburgh Sleep Quality Index; SCAS = Spence Children's Anxiety Scale; STAI, STAI-S, STAI-T = State-Trait Anxiety Inventory, S= State subscale, T= Trait subscale; ICD = International Statistical Classification of Diseases and Related Health Problems; ACT = Acceptance and Commitment Therapy; HSDQ = Holland Sleep Disorders Questionnaire; HT-I = Hypnotherapy for Insomnia; WLC = Waiting List Control; QoL = Quality of Life scale; YSR = Youth Self-Report (based on DSM subscales for anxiety; Sleepio = a digital sleep improvement program based on CBT-I techniques (developed by Colin Espie and Peter Hames); TAU = Treatment As Usual; DASS = Depression Anxiety Stress Scale; SCI-8 = Sleep Condition Indicator; PHQ-D = Patient Health Questionnaire; BBT-I = Brief Behavioural Therapy for Insomnia; BSI = Brief Symptom Inventory; ClinPsy = Clinical Psychology; PSWQ = Penn State Worry Questionnaire; STPI = Spielberger's State-Trait Personality Inventory; i-sleep = guided, online CBT-I intervention; HAM-A = Hamilton Anxiety Rating Scale. Other terminology: 'Healthwatch' is an online, interactive lifestyle website with no specific mental health or sleep-related content (Griffiths et al., 2010); *'Mental

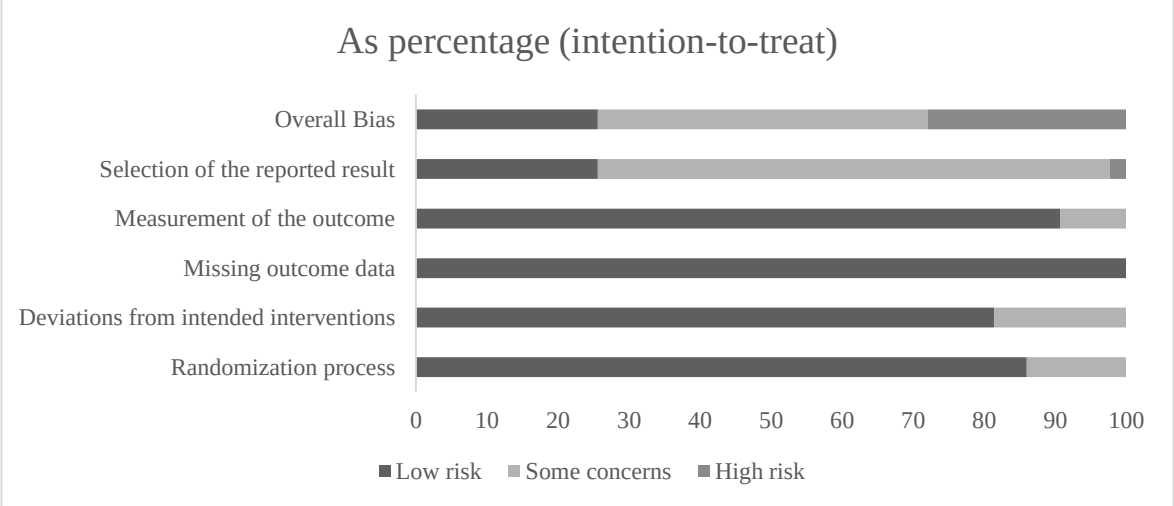
health professionals' included a clinical psychologist, clinical psychology postdoctoral fellows and a licensed clinical social worker; 'BPT' or behavioural placebo therapy is based on the concept of desensitization (Steinmark & Borkovec, 1974) and has been used as a placebo treatment in previous insomnia trials (Arnedt et al., 2011; Edinger et al., 2001); 'Sham Control' or 'Lifestyle Modification'. Sham control instructions were identical to those used by Calhoun and Ford (2007). Participants received no sleep intervention; 'Insomnia relief' is a commercially available program retailed by Ultrasis UK Limited and is based on CBT-I.

Risk of Bias

The quality of articles included in the meta-analysis were reviewed against the Cochrane Risk of Bias tool- Version 2 (Sterne et al., 2019). The risk of bias summary graph is presented (Figure 2). In most domains assessed, the quality of the studies was judged to be of high quality, though there were often a lack of reported information in study protocols, which impacted the quality of the reporting bias domain ('selection of the reported result'). Given the nature of the intervention studies included in this review, particularly those that were delivered face-to-face, it was difficult to blind participants and individuals providing interventions to conditions. However, several studies were able to blind the outcome assessors who obtained and analysed pre-post data. The measures of anxiety used in the studies were generally appropriate to the aims of the studies and had robust psychometric properties.

Figure 2

Risk of bias graph (n = 43)



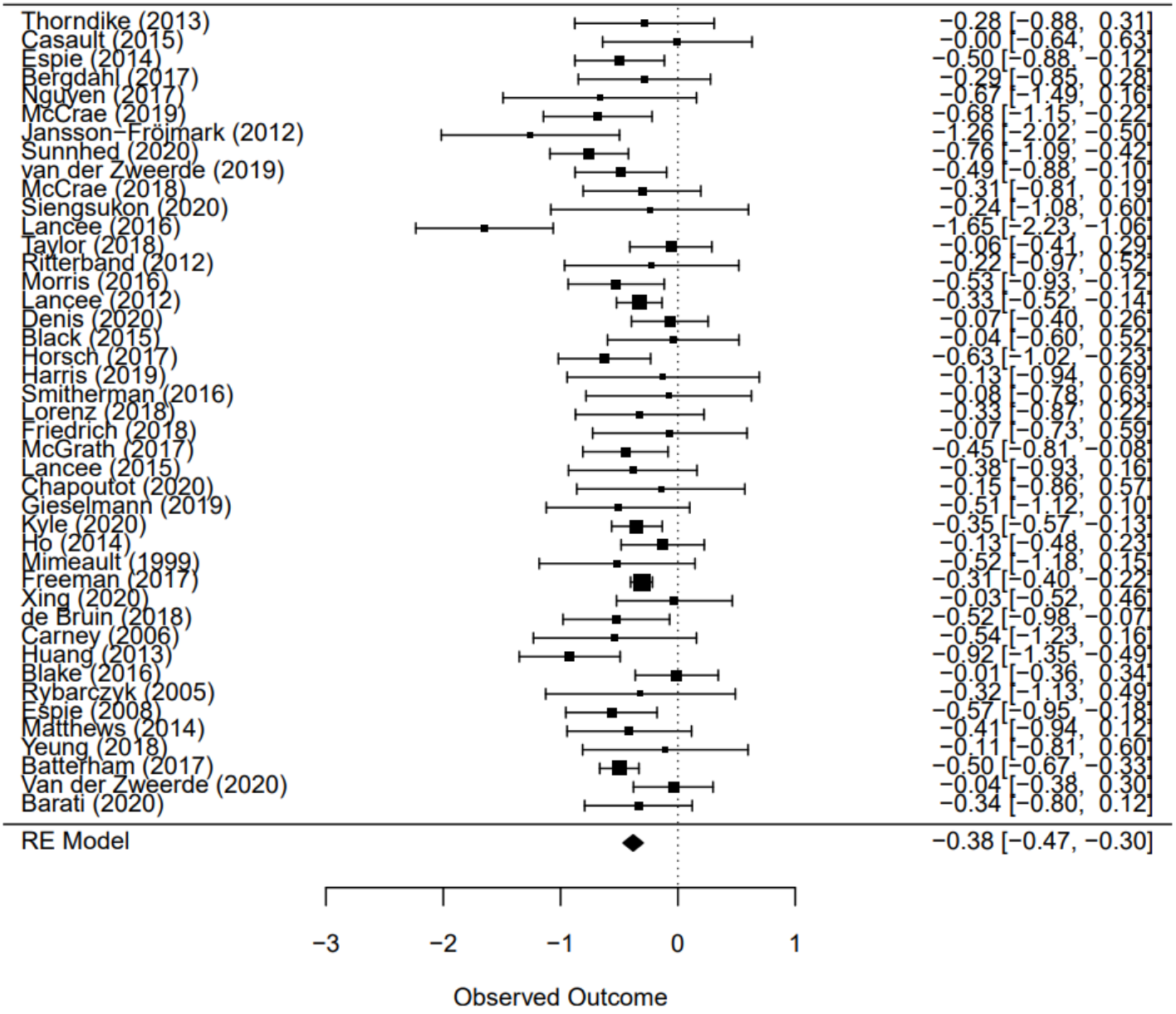
Sleep Interventions and Anxiety Effect Size Summary Data

RQ1. Do non-pharmacological sleep interventions aimed at improving sleep change anxiety symptoms?

All individual effect sizes were negative, indicating that sleep interventions led to a reduction in anxiety symptoms. The results of the overall random effects meta-analysis exploring the effect of sleep interventions on anxiety symptoms at post-treatment are displayed in Figure 3. Across studies, the effect size varied considerably from a large negative effect (-1.65) to a small negative effect (-0.01). Overall, there was a significant, small to moderate effect of non-pharmacological sleep interventions in reducing anxiety symptoms in comparison to control conditions which were not aimed at improving sleep (hedges g = -0.38, 95% CI -0.30 to -0.47, p <.0001, K = 43). The statistical heterogeneity in the effect sizes among studies was moderate (I^2 = 44.86%, Q = 69.83, df = 42, p < 0.005).

Figure 3

Forest plot of the meta-analysis for investigating the effect of non-pharmacological sleep interventions on anxiety symptoms



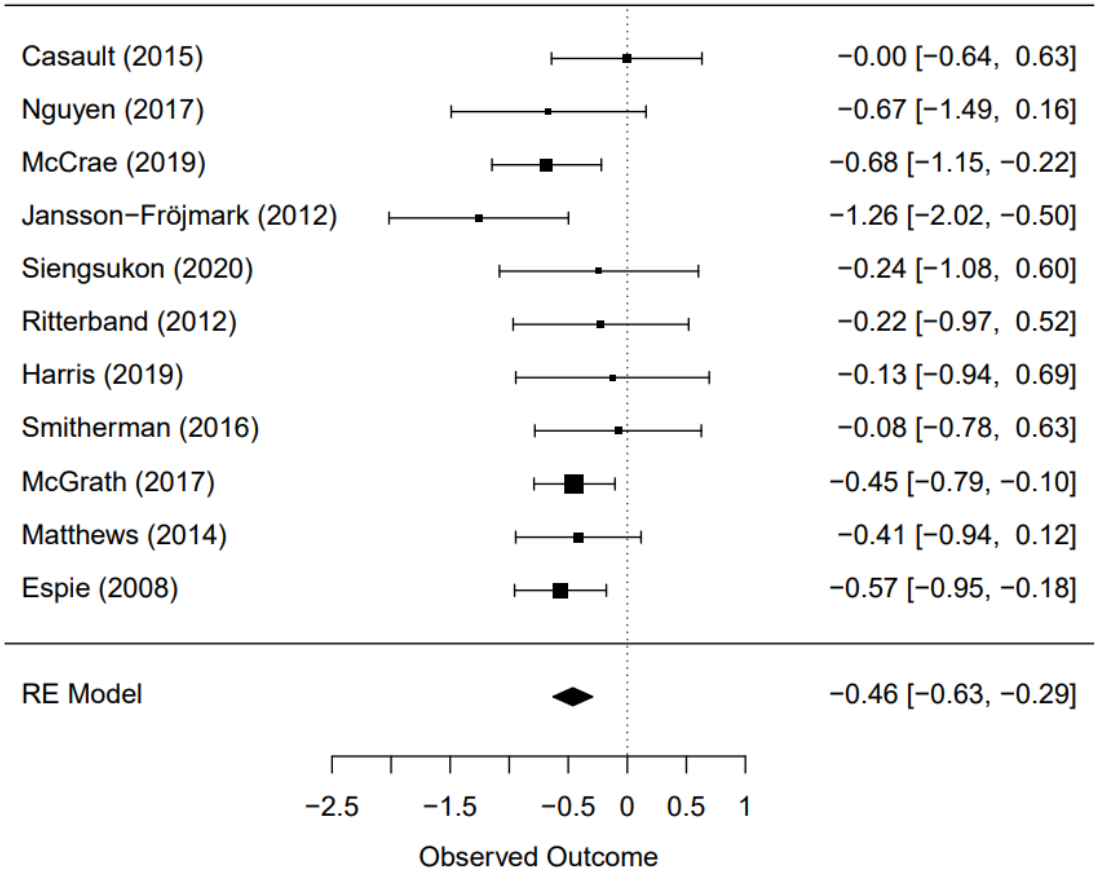
Subgroup Analyses

Sub-group analysis of studies involving participants with additional physical health difficulties

The results of the subgroup analysis exploring the effect of sleep interventions on anxiety symptoms for participants who had comorbid physical health difficulties are displayed in Figure 4. For the 11 studies including participants with physical health conditions, there was a significant, moderate effect of non-pharmacological sleep interventions in reducing anxiety symptoms in comparison to control conditions which were not aimed at improving sleep (hedges *g* = -0.46, 95% CI -0.29 to -0.63, p < .0001, K = 11). The statistical heterogeneity in the effect sizes among these studies was low (I^2 = 0.01%, Q = 10.07, df = 10, p = 0.43).

Figure 4

Forest plot for the subgroup analysis for investigating the effect of non-pharmacological sleep interventions on anxiety symptoms in participants with additional physical health difficulties

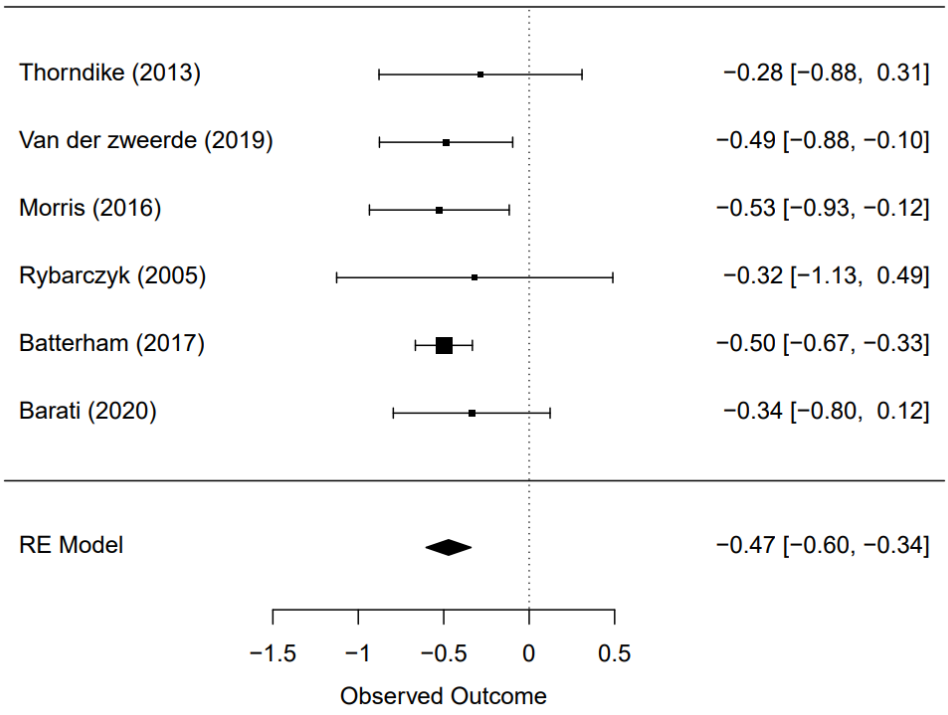


Sub-group analysis of studies involving participants with additional mental health difficulties

A subgroup analysis was conducted on six studies which specifically investigated non-pharmacological sleep interventions efficacy on individuals with comorbid mental health difficulties such as depression, stress, substance misuse disorder and worry, as evaluated by a validated questionnaire tool or diagnostic instrument (Figure 5). For this subgroup, there was a significant moderate effect of non-pharmacological sleep interventions in improving anxiety symptoms relative to control conditions which were not aimed at improving sleep (hedges *g* = -0.47, 95% CI -0.34 to -0.60, p <.0001, K = 6). The statistical heterogeneity among these studies was low (I^2 = 0.00%, Q = 1.03, df = 5, p = 0.96).

Figure 5

Forest plot for the subgroup analysis for investigating the effect of non-pharmacological sleep interventions on participants with elevated mental health difficulties



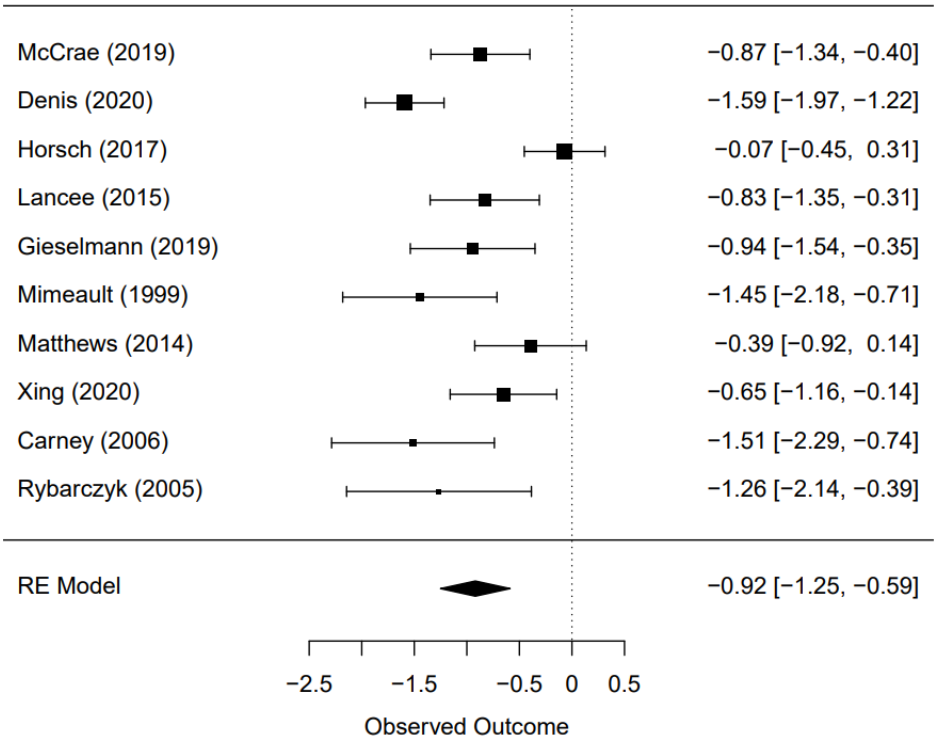
Sleep Interventions and Thought Processes Effect Size Summary Data

RQ2. Do non-pharmacological sleep interventions aimed at improving sleep change sleep-related thought processes?

A secondary meta-analysis was conducted on 10 studies which reported a measure of sleep-related thought processes and where an effect size was able to be computed from data available (Figure 6). For this subgroup, there was a significant, large effect of non-pharmacological sleep interventions in improving sleep-related thought processes in comparison to control conditions which were not aimed at improving sleep (hedges g = -0.92, 95% CI -0.59 to -1.25, p <.0001, K = 10). The statistical heterogeneity in the effect sizes among these studies was large (I^2 = 73.6%, Q = 40.65, df = 9, p < .0001).

Figure 6

Forest plot for the meta-analysis for investigating the effect of non-pharmacological sleep interventions on sleep-related thought processes



Sensitivity Analysis

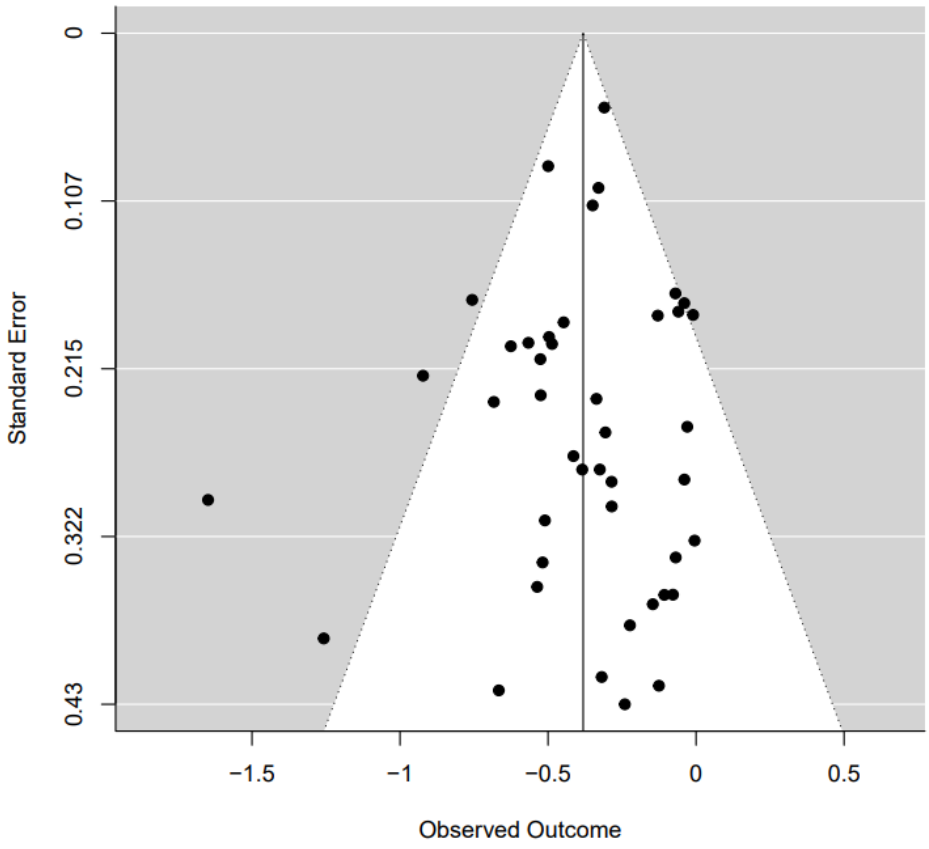
Two sensitivity analyses were performed. Firstly, a sensitivity analysis was conducted by removing 11 studies which were rated poor quality. The effect size was comparable to the overall meta-analysis conducted (hedges g = -0.37, 95% CI -0.28 to -0.46, p <.0001, K = 32). The statistical heterogeneity in the effect sizes among these studies was moderate (I^2 = 42.92%, Q = 49.01, df = 31, p = 0.0210). Secondly, a subgroup analysis was conducted with two notable outliers removed (Lancee et al., 2016; Casault et al., 2015). The effect size was comparable to the overall meta-analysis conducted (hedges g = -0.36, 95% CI -0.29 to -0.44, p <.0001, K = 41). The statistical heterogeneity in the effect sizes among these studies was low (I^2 = 26.82%, Q = 50.02, df = 40, p = 0.13).

Publication Bias

On inspection of the funnel plot (Figure 7), this highlights an almost symmetrical distribution around the mean effect size, implying a limited effect of publication bias on the results. However, there is one notable outlier and some additional inflated effect sizes for some studies, which could relate to these studies having fewer participants, as interpreted from the larger standard errors. To investigate this further, a statistical analysis was computed to assess publication bias of the included studies (Egger et al., 1997). The result was not significant suggesting there is no significant publication bias within the review (t = -0.72 df = 41, p = 0.47). Results from the funnel plot inspection together with the statistical analysis, suggests the findings in the review are reliable and are not affected by publication bias.

Figure 7

Publication bias funnel plot



Discussion

This meta-analysis investigated whether non-pharmacological interventions aimed at improving sleep change anxiety symptoms, and sleep-related thought processes. An overall meta-analysis reviewed the evidence of the impact of non-pharmacological sleep interventions on anxiety symptoms taken at immediate post-intervention, comparative to a control. Two additional subgroup analyses were conducted to explore the impact of non-pharmacological sleep interventions on anxiety symptoms in participants with physical and mental health comorbidities. Finally, a secondary meta-analysis was conducted to review the impact of non-pharmacological sleep interventions on sleep-related thought processes taken at immediate post-intervention, comparative to a control.

The overall meta-analysis indicated that non-pharmacological sleep interventions reduce the severity of anxiety symptoms, and this finding was not impacted by publication bias. The pooled effect on anxiety symptoms was in the small to moderate range. The results suggest that despite not targeting anxiety directly, a non-pharmacological sleep intervention can improve anxiety symptoms. This supports previous research indicating a bidirectional relationship exists between anxiety and insomnia (Alvaro et al., 2013). These findings also reflect previous effect sizes found on the impact of CBT-I on anxiety, stress and worry (Belleville et al., 2011), and similar findings on the impact of non-pharmacological sleep interventions on depression (Gee et al., 2019). Additionally, previous meta-analyses which have investigated the impact of a CBT intervention for anxiety, on anxiety symptoms, have found effect sizes ranging from small to large (Watts et al., 2015; Goncalves & Byrne, 2012; Carpenter et al., 2018). The differences in these findings could be attributed to a variety of factors including the type of anxiety disorder, participant population, and measures used. This meta-analysis attempted to account for some of these possible factors through subgroup analyses, and by limiting the type of measure to those measuring anxiety symptomology only.

Importantly to note, our findings found moderate heterogeneity in the main meta-analysis and large heterogeneity in the sleep-related thought process secondary meta-analysis. Many factors are likely to have contributed to increased heterogeneity including differing methodological procedures employed, different modalities in which the therapy was delivered (face-to-face versus online/app), differing number of participants in intervention versus control conditions, age ranges, intervention types, and different assessment methods used. This meta-analysis explored possible sources of heterogeneity by conducting subgroup analyses on studies involving participants with physical and mental health difficulties. When these analyses were conducted, heterogeneity reduced.

This could suggest individual differences may contribute to the moderate heterogeneity found in the overall meta-analysis.

For participants with additional physical health difficulties, sleep interventions had a moderate effect on anxiety symptoms and there was low heterogeneity within this analysis. Some of the included studies in this review focused on participants with cancer. This has clinical importance for physical health settings given insomnia and anxiety are common in cancer patients (Nikbakhsh et al., 2014; Savard & Morin, 2001). Our findings differ from recent meta-analyses investigating the efficacy of anxiety-based psychological interventions on anxiety in patients with cancer, which found an overall pooled effect size in the small range (Sanjida et al., 2018). This could suggest sleep interventions may be more beneficial for individuals struggling with anxiety in this population.

For participants with additional mental health difficulties, sleep interventions had a moderate effect on anxiety symptoms and there was low heterogeneity within this analysis. Given there was a slightly larger effect size in those with additional mental health difficulties, this indicates sleep interventions may be more beneficial for these individuals. This is in line with previous research which investigated the impact of non-pharmacological sleep interventions on depression, which also found elevated effect sizes in clinical populations (Gee et al., 2019). However, only six studies were included in this subgroup analysis, and all participants involved were adults. Therefore, further research is warranted investigating the impact of sleep interventions on those with mental health difficulties, particularly in the child and adolescent population.

A secondary meta-analysis indicated non-pharmacological sleep interventions led to reductions in sleep-related thought processes, particularly dysfunctional beliefs, and attitudes about sleep, with an overall pooled effect size in the large range. This reflects a similar meta-analysis investigating the effects of CBT-I on dysfunctional beliefs and

attitudes about sleep, where a large effect was found (Thakral et al., 2020). Importantly to consider, the study by Horsch et al. (2017) which was included in this secondary meta-analysis found a notably small effect size compared to the other studies included. Interestingly, this intervention was an app-based insomnia treatment which did not include cognitive components of CBT-I (Horsch et al., 2017). However, no studies in this secondary meta-analysis included child or adolescent participants, suggesting more research is needed in understanding the mechanisms underlying insomnia in this population.

Clinical Implications

Overall, these findings suggest non-pharmacological sleep interventions could be beneficial for individuals with anxiety symptoms. This has clinical implications where services may consider screening individuals for insomnia and other sleep problems, as well as common mental health difficulties. Notably, given the common prevalence of both anxiety and insomnia in individuals with physical health difficulties, and given the moderate effect found in this subgroup, it may be particularly important to screen for both anxiety and sleep disturbance in this population.

Results from the secondary meta-analysis suggests non-pharmacological sleep interventions can reduce unhelpful sleep-related thought processes. This is clinically important given research has found a greater improvement in dysfunctional beliefs about sleep (after CBT-I) was associated with greater improvement in insomnia symptoms (Eidelman et al., 2016), sleep efficiency (Morin et al., 2002) and depression symptoms (Sunnhed & Jansson-Frojmark, 2014). This demonstrates the importance of screening for anxiety and sleep-related thought processes both clinically and in intervention research. Moreover, although our results may help us to understand the mechanisms by which treatment for sleep can in turn improve anxiety, more understanding of the interactions between these variables is needed. Notably, only eleven studies included in this meta-

analysis used a sleep-related thought measure, none of which were conducted with children or adolescents and eight of which was the Dysfunctional Beliefs and Attitudes About Sleep scale. Therefore, conclusions cannot be drawn about other maintenance factors such as sleep effort. Understanding further the interactions between sleep-related thought processes and anxiety can only be achieved if measures are administered. This highlights the importance for future anxiety and sleep intervention research to consider measures of sleep-related thought processes, especially in the child and adolescent population.

Importantly for clinical practice, the findings from this meta-analysis suggest non-pharmacological sleep interventions could be offered to individuals with anxiety difficulties. Some studies included in this review found treatment effectiveness with widely accessible treatment interventions such as app-based CBT-I. Therefore, these findings suggest sleep interventions may be offered in accessible modalities. Clinically, this could improve access and waiting times in psychological services.

Strengths and Limitations

This review provides a novel contribution to the literature, accounting for various subgroups within the overall analysis, and has several strengths. Notably, this was the first review to explore the effect of sleep interventions on anxiety symptoms in individuals with comorbid physical health difficulties. The meta-analysis included RCTs only, which are considered the ‘gold standard’ for effectiveness research (Hariton & Locascio, 2018), thus improving the validity of this study. Most of the anxiety measures included within the review had good psychometric properties. There was a robust and strict approach adopted to ensure control conditions did not include any components of a sleep intervention, which strengthens the findings of this meta-analysis. Moreover, the two sensitivity analyses conducted did not result in any significant changes in the overall effect size. This

demonstrates our review can be regarded with a higher degree of certainty (Bown & Sutton, 2010).

There are some limitations of this current review which are important to discuss. Within the two subgroup analyses, there was a small number of studies included, particularly for the mental health subgroup. Therefore, this should be considered when interpreting the results. Only two RCTs included in this review focused on adolescents, thus the results cannot be generalised to this population. However, this further highlights the importance for future research in the field of insomnia and concomitant mental health difficulties to be focused on the adolescent population. The meta-analysis did not differentiate between different anxiety disorders, such as social phobia, thus conclusions cannot be drawn about specific anxiety disorders.

While current sleep medication was an exclusion criterion, it was not always possible to establish this from study reporting, therefore it is possible that some studies included participants who were taking medication to improve sleep. Additionally, it was not possible to establish whether participants included in the review had received any support for anxiety either before or after engagement in the study, as this was not reported in any of the studies included in the review. As this review focused only on immediate post-intervention effects, conclusions cannot be drawn about the long-term effects of sleep interventions on anxiety symptoms. However, most studies did not report long-term follow up data. Therefore, future research could include long-term follow up data to enable further meta-analyses to explore the long-term effects of non-pharmacological sleep interventions on anxiety symptoms.

Despite these limitations, the findings from this meta-analysis provide an important contribution to the literature. The findings suggest despite not targeting anxiety directly, anxiety symptoms can improve after a sleep-focused intervention. The findings provide

important clinical implications including the importance of screening both anxiety and sleep disturbance, as well as providing evidence to suggest a non-pharmacological sleep intervention may be considered in the treatment of anxiety.

Future Research

As highlighted from our findings, more understanding is needed to explore whether sleep-related thought processes explain the pathway of change for anxiety improving after a sleep intervention. Therefore, future research could explore this pathway to investigate whether sleep interventions change sleep-related thoughts, which then leads to a change in anxiety. Future research would also benefit from exploring the effectiveness of combined anxiety-sleep interventions, comparative to sleep-targeted interventions in isolation. This would determine any advantage of directly targeting anxiety. Additional research is needed to (1) understand the long-term effects of non-pharmacological sleep interventions on anxiety symptoms, and (2) to understand the effectiveness of non-pharmacological sleep interventions on adolescent sleep, and comorbid mental health problems.

Conclusions

The results from this review provide evidence to suggest non-pharmacological interventions aimed at improving sleep; (1) improve anxiety symptoms, with a pooled effect size in the small to moderate range, (1a) improve anxiety symptoms for participants with physical health difficulties with a pooled effect size in the moderate range, (1b) improve anxiety symptoms for participants with mental health difficulties with a pooled effect size in the moderate range, (2) improve sleep-related thought processes, with a pooled effect size in the large range. This suggests non-pharmacological sleep interventions may be useful as an approach when treating individuals with anxiety symptoms.

References

Alberta Medical Association (2015) *Assessment to management of adult insomnia. Clinical practice guideline*. https://top.albertadoctors.org/CPGs/Lists/CPGDocumentList/Adult-Insomnia-CPG.pdf

Alvaro, P. K., Roberts, R. M., & Harris, J. K. (2013). A systematic review assessing bidirectionality between sleep disturbances, anxiety, and depression. *Sleep*, *36*(7), 1059-1068. https://doi.org/10.5665/sleep.2810

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.

Arnedt, J. T., Conroy, D. A., Armitage, R., & Brower, K. J. (2011). Cognitive-behavioral therapy for insomnia in alcohol dependent patients: a randomized controlled pilot trial. *Behaviour research and therapy*, *49*(4), 227-233. https://doi.org/10.1016/j.brat.2011.02.003

Bamer, A. M., Johnson, K. L., Amtmann, D., & Kraft, G. H. (2008). Prevalence of sleep problems in individuals with multiple sclerosis. *Multiple Sclerosis Journal*, 14(8), 1127-1130. https://doi.org/10.1177%2F1352458508092807

Barati, N., & Amini, Z. (2020). The effect of multicomponent sleep hygiene education on sleep quality and mental health in patients suffering from substance abuse. *Current Psychology*, 1-7. https://doi.org/10.1007/s12144-020-01145-w

Batterham, P. J., Christensen, H., Mackinnon, A. J., Gosling, J. A., Thorndike, F. P., Ritterband, L. M., ... & Griffiths, K. M. (2017). Trajectories of change and long-term outcomes in a randomised controlled trial of internet-based insomnia treatment to prevent depression. *BJPsych Open*, *3*(5), 228-235. https://doi.org/10.1192/bjpo.bp.117.005231

Belleville, G., Cousineau, H., Levrier, K., & St-Pierre-Delorme, M. È. (2011). Meta-analytic review of the impact of cognitive-behavior therapy for insomnia on concomitant anxiety. *Clinical Psychology Review*, *31*(4), 638-652.

Belleville, G., Cousineau, H., Levrier, K., St-Pierre-Delorme, M. E., & Marchand, A. (2010). The impact of cognitive-behavior therapy for anxiety disorders on concomitant sleep disturbances: a meta-analysis. In *Database of Abstracts of Reviews of Effects (DARE): Quality-assessed Reviews [Internet]*. Centre for Reviews and Dissemination (UK). http://dx.doi.org/10.1016/j.janxdis.2010.02.010

Bergdahl, L., Broman, J. E., Berman, A. H., Haglund, K., von Knorring, L., & Markström, A. (2016). Auricular acupuncture and cognitive behavioural therapy for insomnia: a randomised controlled study. *Sleep disorders*, *2016*. https://doi.org/10.1016/j.cpr.2011.02.004

Black, D. S., O'Reilly, G. A., Olmstead, R., Breen, E. C., & Irwin, M. R. (2015). Mindfulness meditation and improvement in sleep quality and daytime impairment among older adults with sleep disturbances: a randomized clinical trial. *JAMA internal medicine*, *175*(4), 494-501. doi:10.1001/jamainternmed.2014.8081

Blake, M. J., Sheeber, L. B., Youssef, G. J., Raniti, M. B., & Allen, N. B. (2017). Systematic review and meta-analysis of adolescent cognitive–behavioral sleep interventions. *Clinical child and family psychology review*, *20*(3), 227-249. https://doi.org/10.1007/s10567-017-0234-5

Blake, M., Waloszek, J. M., Schwartz, O., Raniti, M., Simmons, J. G., Blake, L., ... & Trinder, J. (2016). The SENSE study: Post intervention effects of a randomized controlled trial of a cognitive–behavioral and mindfulness-based group sleep improvement intervention among

at-risk adolescents. *Journal of Consulting and Clinical Psychology*, *84*(12), 1039. https://psycnet.apa.org/doi/10.1037/ccp0000142

Boeschoten, R. E., Braamse, A. M., Beekman, A. T., Cuijpers, P., van Oppen, P., Dekker, J., & Uitdehaag, B. M. (2017). Prevalence of depression and anxiety in multiple sclerosis: a systematic review and meta-analysis. *Journal of the neurological sciences*, *372*, 331-341. https://doi.org/10.1016/j.jns.2016.11.067

Bown, M. J., & Sutton, A. J. (2010). Quality control in systematic reviews and meta-analyses. *European Journal of Vascular and Endovascular Surgery*, *40*(5), 669-677. https://doi.org/10.1016/j.ejvs.2010.07.011

Calhoun, A. H., & Ford, S. (2007). Behavioral sleep modification may revert transformed migraine to episodic migraine. *Headache: The Journal of Head and Face Pain*, *47*(8), 1178-1183. https://doi.org/10.1111/j.1526-4610.2007.00780.x

Carney, C. E., & Waters, W. F. (2006). Effects of a structured problem-solving procedure on pre-sleep cognitive arousal in college students with insomnia. *Behavioral Sleep Medicine*, *4*(1), 13-28. https://doi.org/10.1207/s15402010bsm0401_2

Carpenter, J. K., Andrews, L. A., Witcraft, S. M., Powers, M. B., Smits, J. A., & Hofmann, S. G. (2018). Cognitive behavioral therapy for anxiety and related disorders: A meta-analysis of randomized placebo-controlled trials. *Depression and anxiety*, *35*(6), 502-514. https://doi.org/10.1002/da.22728

Carter, T., Pascoe, M., Bastounis, A., Morres, I., Callaghan, P., & Parker, A. G. (2021). The effect of physical activity on anxiety in children and young people: a systematic review and meta-analysis. Journal of Affective Disorders. https://doi.org/10.1016/j.jad.2021.02.026

Casault, L., Savard, J., Ivers, H., & Savard, M. H. (2015). A randomized-controlled trial of an early minimal cognitive-behavioural therapy for insomnia comorbid with cancer. *Behaviour research and therapy*, *67*, 45-54. https://doi.org/10.1016/j.brat.2015.02.003

Chapoutot, M., Peter-Derex, L., Schoendorff, B., Faivre, T., Bastuji, H., & Putois, B. (2020). Telehealth-delivered CBT-I programme enhanced by acceptance and commitment therapy for insomnia and hypnotic dependence: A pilot randomized controlled trial. *Journal of sleep research*, e13199. https://doi.org/10.1111/jsr.13199

Cuijpers, P. (2016). Meta-analyses in mental health research. A practical guide. *Amsterdam, the Netherlands: Pim Cuijpers Uitgeverij*.

de Bruin, E. J., Bögels, S. M., Oort, F. J., & Meijer, A. M. (2018). Improvements of adolescent psychopathology after insomnia treatment: results from a randomized controlled trial over 1 year. *Journal of Child Psychology and Psychiatry*, *59*(5), 509-522. https://doi.org/10.1111/jcpp.12834

Denis, D., Eley, T. C., Rijsdijk, F., Zavos, H. M., Keers, R., Espie, C. A., ... & Gregory, A. M. (2020). Is digital cognitive behavioural therapy for insomnia effective in treating sub-threshold insomnia: a pilot RCT. *Sleep Medicine*, *66*, 174-183. https://doi.org/10.1016/j.sleep.2019.10.007

Edinger, J. D., Wohlgemuth, W. K., Radtke, R. A., Marsh, G. R., & Quillian, R. E. (2001). Cognitive behavioral therapy for treatment of chronic primary insomnia: a randomized controlled trial. Jama, 285(14), 1856-1864. doi:10.1001/jama.285.14.1856

Egger, M., Davey Smith, G., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. British Medical Journal, 315, 629--634. https://doi.org/10.1136/bmj.315.7109.629

Eidelman, P., Talbot, L., Ivers, H., Bélanger, L., Morin, C. M., & Harvey, A. G. (2016). Change in dysfunctional beliefs about sleep in behavior therapy, cognitive therapy, and cognitive-behavioral therapy for insomnia. *Behavior therapy*, *47*(1), 102-115. https://doi.org/10.1016/j.beth.2015.10.002

Espie, C. A., & Morin, C. M. (2003). Insomnia: A clinical guide to assessment and treatment.

Espie, C. A., Broomfield, N. M., MacMahon, K. M., Macphee, L. M., & Taylor, L. M. (2006). The attention–intention–effort pathway in the development of psychophysiologic insomnia: a theoretical review. *Sleep medicine reviews*, *10*(4), 215-245. https://doi.org/10.1016/j.smrv.2006.03.002

Espie, C. A., Fleming, L., Cassidy, J., Samuel, L., Taylor, L. M., White, C. A., ... & Paul, J. (2008). Randomized controlled clinical effectiveness trial of cognitive behavior therapy compared with treatment as usual for persistent insomnia in patients with cancer. *Journal of clinical oncology*, *26*(28), 4651-4658. DOI: 10.1200/JCO.2007.13.9006

Espie, C. A., Kyle, S. D., Miller, C. B., Ong, J., Hames, P., & Fleming, L. (2014). Attribution, cognition and psychopathology in persistent insomnia disorder: outcome and mediation analysis from a randomized placebo-controlled trial of online cognitive behavioural therapy. *Sleep medicine*, *15*(8), 913-917. https://doi.org/10.1016/j.sleep.2014.03.001

Foley, J. E., & Weinraub, M. (2017). Sleep, affect, and social competence from preschool to preadolescence: distinct pathways to emotional and social adjustment for boys and for girls. *Frontiers in psychology*, *8*, 711. https://doi.org/10.3389/fpsyg.2017.00711

Freeman, D., Sheaves, B., Goodwin, G. M., Yu, L. M., Nickless, A., Harrison, P. J., ... & Hinds, C. (2017). The effects of improving sleep on mental health (OASIS): a randomised controlled trial with mediation analysis. *The Lancet Psychiatry*, *4*(10), 749-758. https://doi.org/10.1016/S2215-0366(17)30328-0

Friedrich, A., Claßen, M., & Schlarb, A. A. (2018). Sleep better, feel better? Effects of a CBT-I and HT-I sleep training on mental health, quality of life and stress coping in university students: a randomized pilot controlled trial. *BMC psychiatry*, *18*(1), 268. https://doi.org/10.1186/s12888-018-1860-2

Gee, B., Orchard, F., Clarke, E., Joy, A., Clarke, T., & Reynolds, S. (2019). The effect of non-pharmacological sleep interventions on depression symptoms: A meta-analysis of randomised controlled trials. *Sleep medicine reviews*, *43*, 118-128. https://doi.org/10.1016/j.smrv.2018.09.004

Gieselmann, A., & Pietrowsky, R. (2019). The effects of brief chat-based and face-to-face psychotherapy for insomnia: a randomized waiting list controlled trial. *Sleep medicine*, *61*, 63-72. https://doi.org/10.1016/j.sleep.2019.03.024

Goncalves, D. C., & Byrne, G. J. (2012). Interventions for generalized anxiety disorder in older adults: systematic review and meta-analysis. *Journal of Anxiety Disorders*, *26*(1), 1-11. https://doi.org/10.1016/j.janxdis.2011.08.010

Griffiths, K. M., Farrer, L., & Christensen, H. (2010). The efficacy of internet interventions for depression and anxiety disorders: a review of randomised controlled trials. *Medical Journal of Australia*, *192*, S4-S11. https://doi.org/10.5694/j.1326-5377.2010.tb03685.x

Hamilton, W. K., Aydin, B., & Mizumoto, A. (2016). MAVIS: meta analysis via shiny. *Merced, CA: Comprehensive R Archive Network (CRAN)*.

Hariton, E., & Locascio, J. J. (2018). Randomised controlled trials—the gold standard for effectiveness research. *BJOG: an international journal of obstetrics and gynaecology*, *125*(13), 1716. https://dx.doi.org/10.1111%2F1471-0528.15199

Harris, K. M., Schiele, S. E., & Emery, C. F. (2019). Pilot randomized trial of brief behavioral treatment for insomnia in patients with heart failure. *Heart & Lung*, *48*(5), 373-380. https://doi.org/10.1016/j.hrtlng.2019.06.003

Harsora, P., & KessMann, J. (2009). Nonpharmacologic management of chronic insomnia. *American family physician*, *79*(2), 125-130.

Harvey, A. G. (2002). A cognitive model of insomnia. *Behaviour research and therapy*, *40*(8), 869-893. https://doi.org/10.1016/S0005-7967(01)00061-4

Harvey, A. G. (2005). A cognitive theory and therapy for chronic insomnia. *Journal of Cognitive Psychotherapy*, *19*(1), 41-59. DOI: 10.1891/jcop.19.1.41.66332

Higgins, J. P., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. Bmj, 327(7414), 557-560. https://doi.org/10.1136/bmj.327.7414.557

Ho, F. Y. Y., Chung, K. F., Yeung, W. F., Ng, T. H. Y., & Cheng, S. K. W. (2014). Weekly brief phone support in self-help cognitive behavioral therapy for insomnia disorder: relevance to adherence and efficacy. *Behaviour research and therapy*, *63*, 147-156. https://doi.org/10.1016/j.brat.2014.10.002

Horsch, C. H., Lancee, J., Griffioen-Both, F., Spruit, S., Fitrianie, S., Neerincx, M. A., ... & Brinkman, W. P. (2017). Mobile phone-delivered cognitive behavioral therapy for insomnia: a randomized waitlist controlled trial. *Journal of medical Internet research*, *19*(4), e70. https://doi.org/10.2196/jmir.6524

Huang, L. B., Tsai, M. C., Chen, C. Y., & Hsu, S. C. (2013). The effectiveness of light/dark exposure to treat insomnia in female nurses undertaking shift work during the evening/night shift. *Journal of Clinical Sleep Medicine*, *9*(7), 641-646. https://doi.org/10.5664/jcsm.2824

Jansson-Fröjmark, M., Linton, S. J., Flink, I. K., Granberg, S., Danermark, B., & Norell-Clarke, A. (2012). Cognitive-behavioral therapy for insomnia co-morbid with hearing impairment: A randomized controlled trial. *Journal of Clinical Psychology in Medical Settings*, *19*(2), 224-234. https://doi.org/10.1007/s10880-011-9275-y

Janzen Claude, J. A., Hadjistavropoulos, H. D., & Friesen, L. (2014). Exploration of health anxiety among individuals with diabetes: Prevalence and implications. *Journal of Health Psychology*, *19*(2), 312-322. https://doi.org/10.1177%2F1359105312470157

Kyle, S. D., Hurry, M. E., Emsley, R., Marsden, A., Omlin, X., Juss, A., ... & Sexton, C. E. (2020). The effects of digital cognitive behavioral therapy for insomnia on cognitive function: a randomized controlled trial. *Sleep*. https://doi.org/10.1093/sleep/zsaa034

Lancee, J., Eisma, M. C., van Straten, A., & Kamphuis, J. H. (2015). Sleep-related safety behaviors and dysfunctional beliefs mediate the efficacy of online CBT for insomnia: a randomized controlled trial. *Cognitive Behaviour Therapy*, *44*(5), 406-422. https://doi.org/10.1080/16506073.2015.1026386

Lancee, J., van den Bout, J., van Straten, A., & Spoormaker, V. I. (2012). Internet-delivered or mailed self-help treatment for insomnia? A randomized waiting-list controlled trial. *Behaviour research and therapy*, *50*(1), 22-29. https://doi.org/10.1016/j.brat.2011.09.012

Lancee, J., van Straten, A., Morina, N., Kaldo, V., & Kamphuis, J. H. (2016). Guided online or face-to-face cognitive behavioral treatment for insomnia: a randomized wait-list controlled trial. *Sleep*, *39*(1), 183-191. https://doi.org/10.5665/sleep.5344

LeBlanc, M., Mérette, C., Savard, J., Ivers, H., Baillargeon, L., & Morin, C. M. (2009). Incidence and risk factors of insomnia in a population-based sample. *Sleep*, *32*(8), 1027-1037. https://doi.org/10.1093/sleep/32.8.1027

Lemyre, A., Belzile, F., Landry, M., Bastien, C. H., & Beaudoin, L. P. (2020). Pre-sleep cognitive activity in adults: A systematic review. Sleep medicine reviews, 50, 101253. https://doi.org/10.1016/j.smrv.2019.101253

Lenz, S.A. (2018). Cognitive Behavioral Therapy for Anxiety: An Application of the F.E.A.R. model for adults. *Texas A&M University-Corpus Christi.*

Lorenz, N., Heim, E., Roetger, A., Birrer, E., & Maercker, A. (2019). Randomized controlled trial to test the efficacy of an unguided online intervention with automated feedback for the treatment of insomnia. *Behavioural and cognitive psychotherapy*, *47*(3), 287-302. https://doi.org/10.1017/S1352465818000486

Lovato, N., & Gradisar, M. (2014). A meta-analysis and model of the relationship between sleep and depression in adolescents: recommendations for future research and clinical practice. *Sleep medicine reviews*, *18*(6), 521-529. https://doi.org/10.1016/j.smrv.2014.03.006

Martín-Merino, E., Ruigómez, A., Wallander, M. A., Johansson, S., & García-Rodríguez, L. A. (2010). Prevalence, incidence, morbidity and treatment patterns in a cohort of patients diagnosed with anxiety in UK primary care. *Family practice*, *27*(1), 9-16. https://doi.org/10.1093/fampra/cmp071

Matthews, E. E., Berger, A. M., Schmiege, S. J., Cook, P. F., McCarthy, M. S., Moore, C. M., & Aloia, M. S. (2014, May). Cognitive behavioral therapy for insomnia outcomes in women after primary breast cancer treatment: a randomized, controlled trial. In *Oncology nursing forum* (Vol. 41, No. 3). doi:10.1188/14.ONF.41-03AP

McCall, W. V. (2004). Sleep in the elderly: burden, diagnosis, and treatment. *Primary care companion to the Journal of clinical psychiatry*, *6*(1), 9. https://dx.doi.org/10.4088%2Fpcc.v06n0104

McCrae, C. S., Curtis, A. F., Williams, J. M., Dautovich, N. D., McNamara, J. P., Stripling, A., ... & Marsiske, M. (2018). Efficacy of brief behavioral treatment for insomnia in older adults: examination of sleep, mood, and cognitive outcomes. *Sleep medicine*, *51*, 153-166. https://doi.org/10.1016/j.sleep.2018.05.018

McCrae, C. S., Williams, J., Roditi, D., Anderson, R., Mundt, J. M., Miller, M. B., ... & Robinson, M. E. (2019). Cognitive behavioral treatments for insomnia and pain in adults with comorbid chronic insomnia and fibromyalgia: clinical outcomes from the SPIN randomized controlled trial. *Sleep*, *42*(3), zsy234. https://doi.org/10.1093/sleep/zsy234

McGrath, E. R., Espie, C. A., Power, A., Murphy, A. W., Newell, J., Kelly, C., ... & O'Donnell, M. J. (2017). Sleep to lower elevated blood pressure: a randomized controlled trial (SLEPT). *American journal of hypertension*, *30*(3), 319-327. https://doi.org/10.1093/ajh/hpw132

McMakin, D. L., & Alfano, C. A. (2015). Sleep and anxiety in late childhood and early adolescence. *Current Opinion in Psychiatry*, *28*(6), 483. https://dx.doi.org/10.1097%2FYCO.0000000000000204

Mimeault, V., & Morin, C. M. (1999). Self-help treatment for insomnia: bibliotherapy with and without professional guidance. *Journal of consulting and clinical psychology*, *67*(4), 511.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, *6*(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Morin, C. M., Blais, F., & Savard, J. (2002). Are changes in beliefs and attitudes about sleep related to sleep improvements in the treatment of insomnia?. *Behaviour research and therapy*, *40*(7), 741-752. https://doi.org/10.1016/S0005-7967(01)00055-9

Morin, C. M., Stone, J., Trinkle, D., Mercer, J., & Remsberg, S. (1993). Dysfunctional beliefs and attitudes about sleep among older adults with and without insomnia complaints. *Psychology and aging*, *8*(3), 463. https://psycnet.apa.org/doi/10.1037/0882-7974.8.3.463

Morphy, H., Dunn, K.M., Boardman, H.F. and Croft, P.R. (2007) Epidemiology of insomnia: a longitudinal study in a UK population. *Sleep* **30**(3), 274-280. https://doi.org/10.1093/sleep/30.3.274

Morris, J., Firkins, A., Millings, A., Mohr, C., Redford, P., & Rowe, A. (2016). Internet-delivered cognitive behavior therapy for anxiety and insomnia in a higher education context. *Anxiety, Stress, & Coping*, *29*(4), 415-431. https://doi.org/10.1080/10615806.2015.1058924

National Institute for Health and Care Excellence. (2014). *Anxiety Disorders.* Retrieved from: Overview | Anxiety disorders | Quality standards | NICE

National Institute for Health and Care Excellence. (2020). *Insomnia.* Retrieved from: Insomnia | Health topics A to Z | CKS | NICE

Nguyen, S., McKay, A., Wong, D., Rajaratnam, S. M., Spitz, G., Williams, G., ... & Ponsford, J. L. (2017). Cognitive behavior therapy to treat sleep disturbance and fatigue after traumatic brain injury: a pilot randomized controlled trial. *Archives of physical medicine and rehabilitation*, *98*(8), 1508-1517. https://doi.org/10.1016/j.apmr.2017.02.031

Nicassio, P. M., Mendlowitz, D. R., Fussell, J. J., & Petras, L. (1985). The phenomenology of the pre-sleep state: the development of the pre-sleep arousal scale. *Behaviour research and therapy*, *23*(3), 263-271. https://doi.org/10.1016/0005-7967(85)90004-X

Nikbakhsh, N., Moudi, S., Abbasian, S., & Khafri, S. (2014). Prevalence of depression and anxiety among cancer patients. *Caspian journal of internal medicine*, 5(3), 167.

Price, M. A., Zachariae, R., Butow, P. N., deFazio, A., Chauhan, D., Espie, C. A., ... & Quality of Life Study Investigators. (2009). Prevalence and predictors of insomnia in women with invasive ovarian cancer: anxiety a major factor. *European journal of cancer, 45*(18), 3262-3270. https://doi.org/10.1016/j.ejca.2009.05.030

Ritterband, L. M., Bailey, E. T., Thorndike, F. P., Lord, H. R., Farrell-Carnahan, L., & Baum, L. D. (2012). Initial evaluation of an Internet intervention to improve the sleep of cancer survivors with insomnia. *Psycho-Oncology, 21*(7), 695-705. https://doi.org/10.1002/pon.1969

Rybarczyk, B., Lopez, M., Schelble, K., & Stepanski, E. (2005). Home-based video CBT for comorbid geriatric insomnia: a pilot study using secondary data analyses. *Behavioral sleep medicine*, *3*(3), 158-175. https://doi.org/10.1207/s15402010bsm0303_4

Sanjida, S., McPhail, S. M., Shaw, J., Couper, J., Kissane, D., Price, M. A., & Janda, M. (2018). Are psychological interventions effective on anxiety in cancer patients? A systematic review and meta-analyses. *Psycho-oncology*, *27*(9), 2063-2076. https://doi.org/10.1002/pon.4794

Savard, J., & Morin, C. M. (2001). Insomnia in the context of cancer: a review of a neglected problem. *Journal of clinical oncology*, *19*(3), 895-908.

Savard, J., Simard, S., Blanchet, J., Ivers, H., & Morin, C. M. (2001). Prevalence, clinical characteristics, and risk factors for insomnia in the context of breast cancer. *Sleep, 24*(5), 583-590. https://doi.org/10.1093/sleep/24.5.583

Savard, J., Simard, S., Ivers, H., & Morin, C. M. (2005). Randomized study on the efficacy of cognitive-behavioral therapy for insomnia secondary to breast cancer, part I: Sleep and psychological effects. *Journal of Clinical Oncology*, *23*(25), 6083-6096.

Siengsukon, C. F., Alshehri, M., Williams, C., Drerup, M., & Lynch, S. (2020). Feasibility and treatment effect of cognitive behavioral therapy for insomnia in individuals with multiple sclerosis: A pilot randomized controlled trial. *Multiple Sclerosis and Related Disorders*, *40*, 101958. https://doi.org/10.1016/j.msard.2020.101958

Smitherman, T. A., Walters, A. B., Davis, R. E., Ambrose, C. E., Roland, M., Houle, T. T., & Rains, J. C. (2016). Randomized controlled pilot trial of behavioral insomnia treatment for chronic migraine with comorbid insomnia. *Headache: The Journal of Head and Face Pain*, *56*(2), 276-291. https://doi.org/10.1111/head.12760

Soehner, A. M., & Harvey, A. G. (2012). Prevalence and functional consequences of severe insomnia symptoms in mood and anxiety disorders: results from a nationally representative sample. *Sleep*, *35*(10), 1367-1375.

Somers, J. M., Goldner, E. M., Waraich, P., & Hsu, L. (2006). Prevalence and incidence studies of anxiety disorders: a systematic review of the literature. *The Canadian Journal of Psychiatry*, 51(2), 100-113. https://doi.org/10.1177%2F070674370605100206

Steinmark, S. W., & Borkovec, T. D. (1974). Active and placebo treatment effects on moderate insomnia under counterdemand and positive demand instructions. *Journal of Abnormal Psychology*, *83*(2), 157. https://psycnet.apa.org/doi/10.1037/h0036489

Sterne, J. A., Savović, J., Page, M. J., Elbers, R. G., Blencowe, N. S., Boutron, I., ... & Higgins, J. P. (2019). RoB 2: a revised tool for assessing risk of bias in randomised trials. *bmj*, *366*. https://doi.org/10.1136/bmj.l4898

Sunnhed, R., & Jansson-Fröjmark, M. (2014). Are changes in worry associated with treatment response in cognitive behavioral therapy for insomnia?. *Cognitive behaviour therapy*, *43*(1), 1-11. https://doi.org/10.1080/16506073.2013.846399

Sunnhed, R., Hesser, H., Andersson, G., Carlbring, P., Morin, C. M., Harvey, A. G., & Jansson-Fröjmark, M. (2020). Comparing internet-delivered cognitive therapy and behavior therapy with telephone support for insomnia disorder: a randomized controlled trial. *Sleep*, *43*(2), zsz245. https://doi.org/10.1093/sleep/zsz245

Tang, N. K., Wright, K. J., & Salkovskis, P. M. (2007). Prevalence and correlates of clinical insomnia co-occurring with chronic back pain. *Journal of sleep research*, *16*(1), 85-95. https://doi.org/10.1111/j.1365-2869.2007.00571.x

Taylor, D. J., Peterson, A. L., Pruiksma, K. E., Hale, W. J., Young-McCaughan, S., Wilkerson, A., ... & Borah, E. V. (2018). Impact of cognitive behavioral therapy for insomnia disorder on sleep and comorbid symptoms in military personnel: a randomized clinical trial. *Sleep*, *41*(6), zsy069. https://doi.org/10.1093/sleep/zsy069

Thakral, M., Von Korff, M., McCurry, S. M., Morin, C. M., & Vitiello, M. V. (2020). Changes in dysfunctional beliefs about sleep after cognitive behavioral therapy for insomnia: A systematic literature review and meta-analysis. *Sleep Medicine Reviews*, *49*, 101230. https://doi.org/10.1016/j.smrv.2019.101230

Thorndike, F. P., Ritterband, L. M., Gonder-Frederick, L. A., Lord, H. R., Ingersoll, K. S., & Morin, C. M. (2013). A randomized controlled trial of an internet intervention for adults with insomnia: effects on comorbid psychological and fatigue symptoms. *Journal of clinical psychology*, *69*(10), 1078-1093. https://doi.org/10.1002/jclp.22032

Van der Zweerde, T., Lancee, J., Slottje, P., Bosmans, J. E., Van Someren, E. J., & Van Straten, A. (2020). Nurse-guided internet-delivered cognitive behavioral therapy for insomnia in general practice: Results from a pragmatic randomized clinical trial. *Psychotherapy and psychosomatics*, *89*(3), 174-184. https://doi.org/10.1159/000505600

Van der Zweerde, T., Van Straten, A., Effting, M., Kyle, S. D., & Lancee, J. (2019). Does online insomnia treatment reduce depressive symptoms? A randomized controlled trial in individuals with both insomnia and depressive symptoms. *Psychological medicine*, *49*(3), 501-509. https://doi.org/10.1017/S0033291718001149

van Straten, A., van der Zweerde, T., Kleiboer, A., Cuijpers, P., Morin, C. M., & Lancee, J. (2018). Cognitive and behavioral therapies in the treatment of insomnia: a meta-analysis. *Sleep Medicine Reviews*, *38*, 3-16. https://doi.org/10.1016/j.smrv.2017.02.001

Watts, S. E., Turnell, A., Kladnitski, N., Newby, J. M., & Andrews, G. (2015). Treatment-as-usual (TAU) is anything but usual: a meta-analysis of CBT versus TAU for anxiety and depression. *Journal of affective disorders*, *175*, 152-167. https://doi.org/10.1016/j.jad.2014.12.025

Wilson, S., Anderson, K., Baldwin, D., Dijk, D. J., Espie, A., Espie, C., ... & Sharpley, A. (2019). British Association for Psychopharmacology consensus statement on evidence-based treatment of insomnia, parasomnias and circadian rhythm disorders: an update. *Journal of Psychopharmacology*, *33*(8), 923-947. https://doi.org/10.1177%2F0269881119855343

Xing, J., Wu, X., Liu, H., Wang, J., Jiang, S., Lozada, A., & Wang, Y. (2020). Effects of Electroacupuncture Therapy and Cognitive Behavioral Therapy in Chronic Insomnia: A Randomized Controlled Study. *Evidence-Based Complementary and Alternative Medicine*, *2020*. https://doi.org/10.1155/2020/5630130

Yeung, W. F., Ho, F. Y. Y., Chung, K. F., Zhang, Z. J., Yu, B. Y. M., Suen, L. K. P., ... & Lao, L. X. (2018). Self-administered acupressure for insomnia disorder: a pilot randomized controlled trial. *Journal of sleep research*, *27*(2), 220-231. https://doi.org/10.1111/jsr.12597

Chapter 3. Bridging Chapter

The purpose of this chapter is to provide an overview of how the two projects (meta-analysis, Chapter 2; empirical research project, Chapter 4) presented within this thesis portfolio link together.

The meta-analysis found non-pharmacological sleep interventions have a small to moderate effect on anxiety symptoms. For participants with additional physical health difficulties, sleep interventions had a moderate effect on anxiety symptoms. For participants with additional mental health difficulties, sleep interventions had a moderate effect on anxiety symptoms. The results suggest that despite not targeting anxiety directly, a non-pharmacological sleep intervention can improve anxiety symptoms.

Notably, although age range was not restricted in the systematic searches, only two (n = 43) included studies involved adolescent (aged 11-18) participants. This highlights the importance for future research in the field of insomnia and comorbid mental health difficulties to be focused on the child and adolescent population, especially given adolescents with insomnia are at significantly increased risk of also experiencing anxiety (Blank et al., 2015).

The secondary meta-analysis found non-pharmacological sleep interventions have a large effect on sleep-related thought processes, particularly dysfunctional beliefs and attitudes about sleep. The results therefore suggest non-pharmacological sleep interventions can lead to reductions in unhelpful sleep-related thought processes. However, no study in this secondary meta-analysis involved adolescents, therefore less is known about the effects of sleep interventions on sleep-related thought processes in this population. What is more, in adolescents, current research suggests insomnia precedes the further development of additional mental health difficulties, particularly anxiety and depression (McMakin & Alfano, 2015). Thus, arguably, if insomnia is treated early enough, this could prevent additional mental health problems, including anxiety. This

highlights the importance of establishing whether sleep-targeted interventions can lead to improvements in other common mental health problems, and processes involved in the maintenance of poor sleep, as this could have positive clinical implications including increased provision of cost-effective, preventative, and accessible treatments.

Additionally, more research is needed to understand the mechanisms underlying the development and maintenance of insomnia in adolescents. Models of insomnia indicate sleep-related thought processes (including sleep effort, dysfunctional beliefs and attitudes about sleep and sleep anticipatory anxiety) are involved in the maintenance and development in adults. However, these are often not measured in adolescent sleep intervention studies, therefore less is known about these processes in the adolescent population. The empirical project that follows sought to address part of this gap in the literature by exploring the relationships between different sleep and sleep-related thought processes in a sample of adolescents.

There was a second planned stage to the empirical project which was to explore the feasibility of implementing a brief sleep intervention based on Cognitive Behavioural Therapy for Insomnia (CBT-I) principles for adolescents in schools. Sleep-related thought process measures were planned to be completed pre- and post-intervention. However, given the impact of the COVID-19 pandemic and other factors discussed in Chapter 6, this second stage could not be conducted. Further information including an additional introduction, methods, preliminary feasibility results, and discussion can be found in Chapters 6 and 7.

Chapter 4. Empirical Research Project

The Cross-Sectional Relationship Between Insomnia Severity and Sleep-Related Thought Processes in Adolescents

Written for publication to *Journal of Sleep Research*

(Author guidelines for manuscript preparation – Appendix A)

Alex Staines*[1], Hannah Cowie[1], Professor Niall Broomfield[1], Dr Faith Orchard[2], Dr Laura Pass[1]

[1]Department of Clinical Psychology, Norwich Medical School, University of East Anglia

[2]School of Psychology, University of Sussex, UK

Author Note

*Correspondence concerning this article should be addressed to Alex Staines, Department of Clinical Psychology, Norwich Medical School, University of East Anglia, Norwich Research Park, Norwich, Norfolk, NR4 7TJ, ENGLAND, UNITED KINGDOM.

Email: a.staines@uea.ac.uk

Word count: 4963

Reference count: 40

Conflict of interests: None

Abstract

The objective of this study was to determine whether associations between sleep-related thought processes and insomnia severity are evident in a sample of adolescents. Cross-sectional data was collected from 65 adolescents aged 16-19 (68% males). Adolescents completed the Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), Glasgow Sleep Effort Scale (GSES), Dysfunctional Beliefs About Sleep Scale-Child Version (DBAS-C10) and Sleep Anticipatory Anxiety Scale-Adolescent Version (SAAQ-A). A series of correlations with bootstrapping (1000 samples) were performed investigating the relationships between subjective insomnia severity, sleep quality and sleep-related thought processes. The average sleep duration of the sample was 6.58 (SD = 1.77). There was a medium to large positive correlation between sleep effort (GSES) and insomnia severity (ISI; $r = 0.46$, $n = 65$, $p < .01$). There was a small positive correlation between dysfunctional beliefs about sleep (DBAS) and insomnia severity (ISI; $r = 0.24$, $n = 65$, $p < .05$). There was a medium to large positive correlation between sleep anticipatory anxiety (SAAQ) and insomnia severity (ISI; $r = 0.48$, $n = 65$, $p < .01$). There was no significant mean difference in subjective insomnia severity between those who self-reported wanting help for their sleep and those who reported they did not want help for their sleep. The results of this study provide preliminary evidence to suggest sleep-related thought processes are associated with insomnia severity in an adolescent sample. The findings support cognitive models of insomnia and emerging research into the underlying mechanisms of insomnia in adolescents.

Keywords. Cognition, Cognitive Behavioural Therapy, Mental Health, School, Therapy, Youth

Introduction

Adolescence, as defined by the World Health Organisation as aged 10-19 (WHO, 2015), is an important period of social and emotional development. Research in the sleep literature has indicated adolescents require 9–9.25 hours of sleep per night for cognitive function, attention (Short et al., 2018) and emotional regulation (Fuligni et al., 2019). Yet recent research has shown many adolescents do not achieve this, especially on school nights (Gradisar et al., 2011). Research has consistently found the cost of inadequate sleep for adolescents is significant, including poorer mental health, reduced interpersonal and school functioning (Fuligni & Hardway, 2006; Pasch et al., 2010; Wolfson & Carskadon, 1998) as well as decreased mood, lowered motivation (Gradisar et al., 2008), and impaired daytime functioning (Warner et al., 2008). Sleep difficulties appear to be common in this age group cross-culturally, with the lifetime prevalence of insomnia estimated at 10.7% within a sample of 1014 US (United States) adolescents (Johnson et al., 2006) and between 13.6-23.8% in a sample of Norwegian adolescents (Siversten et al., 2014).

A model proposed by Carskadon (2011), coined the ‘Perfect Storm’, describes a theoretical understanding of adolescent sleep problems. The model pertains to the transition from childhood to adolescence and describes a series of factors which contribute to poor sleep, including bioregulatory, psychosocial, and societal pressures. The biological rhythm and circadian preference in daily activities shift forward during puberty, indicating there is a natural inclination for adolescents to wake and go to sleep later (Carskadon, 2011). This impacts the ability to adjust easily to the demands of early morning school start times, therefore increasing adolescents’ vulnerability to chronic sleep deprivation (Carskadon & Acebo, 2002).

In the adult literature, research suggests sleep-related thought processes such as daytime worry, preoccupation about sleep or efforts to control sleep can precipitate, exacerbate, or maintain sleep problems (Espie et al., 2006). In the adolescent literature, emerging research has indicated there are biopsychosocial mechanisms involved in the

maintenance of insomnia. Psychological factors include dysfunctional beliefs and attitudes about sleep (Blake et al., 2018) and pre-sleep worry (Bartel et al., 2015). Additionally, research conducted on a large school-based sample (aged 13-18 years) found evidence to support the association between negative pre-sleep cognitions, sleep anticipatory anxiety and objective and subjective sleep difficulties (Heath et al., 2018). Mechanistically, emerging research has suggested catastrophic thinking and other pre-sleep thoughts are indirectly associated with longer sleep latency through its association with anxiety (Hiller et al., 2014). However, these mechanisms including associations and interactions remain under-researched in adolescents.

Harvey's (2002) Cognitive Model of Insomnia suggests insomnia is developed and maintained when individuals are preoccupied about their sleep, have anticipatory anxiety about sleep, and worry about the daytime consequences of not getting enough sleep. There is emerging research in the adolescent literature suggesting sleep anticipatory anxiety is associated with poorer sleep. In a sample of adolescents diagnosed with Delayed Sleep Phase Disorder (DSPD), increased catastrophising was associated with increased sleep anticipatory anxiety including sleep-related cognitions and non-sleep specific planning/rehearsal cognitions (Hiller et al., 2014). Increased anxiety in these two areas was in turn associated with greater sleep onset latency (Hiller et al., 2014). 'Planning/rehearsal anxiety' refers to pre-sleep thoughts not related specifically to sleep, but nevertheless impact sleep, such as "I worry about my schoolwork". These types of thoughts have been found to be a contributor to poor sleep in children (Gregory et al., 2009). Moreover, planning/rehearsal cognitions and worries about sleep and its anticipated consequences, have been found to be the most common types of thoughts in adults with sleep-onset insomnia (Wicklow & Espie, 2000). There has been little research investigating the relationship between sleep anticipatory anxiety (including areas related to planning/rehearsal) and subjective insomnia severity in community samples of adolescents.

Dysfunctional beliefs about sleep have been identified as a core perpetuating component in cognitive insomnia models (Harvey, 2002; Espie et al., 2006), which are often targeted in Cognitive Behavioural Therapy for Insomnia (CBT-I). For instance, some individuals with insomnia can be preoccupied about the consequences of not getting enough sleep, whilst others hold unrealistic expectations about their sleep requirements. These beliefs can lead to emotional distress and heightened arousal, which in turn maintains a vicious cycle of insomnia (Morin et al., 2007). In the child literature (aged 8-10 years), an association was found between dysfunctional beliefs about sleep and sleep disturbance (Gregory et al., 2009). Additionally, in a large sample (n = 1333) of Chinese college students, an association was found between poor sleep quality and higher endorsement of dysfunctional beliefs and attitudes about sleep (Jin et al., 2018). However, this study did not specifically investigate insomnia severity. Unhelpful dysfunctional beliefs about sleep and their relationship with insomnia and sleep quality in adolescents remains under-researched.

A mechanistic model based on the concept of 'sleep effort' outlines the interaction of maintenance components involved in chronic insomnia (Broomfield & Espie, 2005; Espie et al., 2006). A working model of sleep effort was proposed by Broomfield and Espie (2005) which outlined seven integrated core components: 1) a period of acute insomnia 2) sleep performance failure 3) general anxiety regarding sleeplessness and consequences 4) anticipatory anxiety about sleep 5) sleep avoidance 6) performance effort and control over sleep 7) chronic insomnia. Later, a model based on psychobiological principles was developed; the Attention-Intention Effort Model (Espie et al., 2006). This model suggests after a period of insomnia, unhelpful beliefs about sleep arise (e.g., "I can never sleep again"), leading to anxiety or preoccupation about sleep and its consequences, which leads to worry about going to sleep, or attempts to control sleep. Given the involuntary nature of sleep, these models suggest attempts to control sleep or highly effortful sleep has the paradoxical effect and consequently maintains insomnia. There has

been preliminary evidence to suggest subjective insomnia severity is associated with sleep effort in a sample of adults with insomnia (Hertenstein et al., 2015). To date, there has been no investigation of whether sleep effort associates with insomnia severity in adolescents.

Sleep-related thought processes such as sleep effort, beliefs about sleep and sleep anticipatory anxiety are often not measured in published studies. For instance, a pilot study by Paavonen et al. (2016) used actigraphy as an outcome measure and explored the impact of a brief behavioural based sleep intervention offered to adolescents in schools. The findings from this study were promising, where postintervention improvements were found on sleep duration and sleep quality (Paavonen et al., 2016). Interestingly, the study found those who indicated they would like help for their sleep had significantly more sleeping difficulties (Paavonen et al., 2016). However, this study did not capture other sleep-related thought processes involved in the maintenance of insomnia, highlighting the need for further exploration of these processes in adolescents.

In summary, despite research indicating the common prevalence of adolescent insomnia and the significant impact of this problem, as well as research into mechanistic models in the adult literature, there remains little investigation into the role of sleep-related thought processes in community adolescent samples. This cross-sectional study aimed to address this research gap by exploring the inter-relationships between insomnia, sleep quality, sleep effort, dysfunctional beliefs and attitudes about sleep and sleep anticipatory anxiety, in a sample of adolescents. The following research questions aimed to be addressed:

1. Is there a relationship between adolescents' subjective insomnia severity and sleep effort?
2. Is there a relationship between adolescents' subjective insomnia severity and dysfunctional beliefs and attitudes about sleep?

3. Is there a relationship between adolescents' subjective insomnia severity and sleep anticipatory anxiety?
4. Is there a difference in subjective insomnia severity between young people who report they would like help for their sleep compared with young people who report they would not like help for their sleep?

Methods

Study Population

Sixty-six adolescents (aged 15-19) attending two sixth form colleges in the East of England, completed a sleep survey. One participant was excluded from the study as they did not meet the inclusion age criteria to self-consent to take part. Appropriate risk policies and procedures were followed to manage this. This left a total sample of 65. The mean age of the sample was 16.72 (SD = 0.76) Participant demographics are shown in Table 1. Most of the sample were students studying a sports-related qualification. This study was granted ethics approval by the University of East Anglia Ethics Committee, and participants informed consent was obtained after receiving a complete description of the study.

Table 1

Participant demographics

Characteristic	N (%)
Gender	Male = 44 (67.69)
	Female = 15 (23.08)
	Not specified = 6 (9.23)
Ethnicity	White British = 53 (81.54)
	White and Black Caribbean = 1 (1.54)
	Any Other White Background = 1 (1.54)
	Not specified = 10 (15.38)
Medication	Yes = 0 (0)

	No = 57 (87.69)
	Not specified = 8 (12.31)
Talking therapy	Yes = 2 (3.08)
	No = 55 (84.61)
	Not specified = 8 (12.31)
Would like help for sleep?	Yes = 33 (50.77)
	No = 32 (49.23)

Note. 'Medication' refers to a question asked in the demographics questionnaire *"Do you currently take any tablets or medication to help you sleep?"*; 'Talking therapy' refers to a question asked in the demographic's questionnaire *"Are you currently having any help from another adult (such as a counsellor, school nurse or therapist) for your sleep, mental health or any other worries?";* 'Would you like help for sleep?' refers to a question asked in the demographics questionnaire *"Would you like some help to improve your sleep?"*

Measures

Demographic Information

Demographic information was obtained for the study using a questionnaire which was completed prior to the sleep survey. This information included name, age, gender, and ethnicity. Participants were also asked if they would like support for their sleep. The following measures are all free and available in the public domain.

Insomnia

Insomnia Severity Index (ISI; Bastien et al., 2001). The ISI is a 7-item self-report questionnaire assessing the nature, severity, and impact of insomnia over the past month. Items include "how satisfied/dissatisfied are you with your current sleep pattern?". A 5-point Likert scale is used to rate each item (0 = no problem to 4 = very severe

problem). The total score is interpreted as follows: absence of insomnia (0–7); sub-threshold insomnia (8–14); moderate insomnia (15–21); and severe insomnia (22–28).

The ISI has good test-retest reliability and a strong positive correlation with the Pittsburgh Sleep Quality Index (r = 0.45; Vegar & Hussain, 2017). Additionally, the ISI has good internal consistency (Cronbach's α = 0.84) in non-clinical student samples (Vegar & Hussain, 2017) and in clinical samples (α = 0.90), with the ability to detect clinical cases of insomnia (Morin et al., 2011). The ISI has been used in an adolescent sleep intervention study in a non-clinical sample (Werner-Seidler et al., 2019). Both the Pittsburgh Sleep Quality Index (PSQI) and the ISI were administered as the ISI provides clinical cut off levels for insomnia which the PSQI does not capture. However, the PSQI provides a broad, overall level of sleep functioning.

A reliability analysis was performed on the ISI comprising 7 items. Cronbach's alpha coefficient results indicated the ISI has high reliability and internal consistency (α = 0.86).

Sleep Quality

Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989). The PSQI is a self-report questionnaire assessing sleep quality over a one-month period. The measure consists of 19 individual items assessing sleep quality and disturbances. Items include "during the past month, how often have you had trouble sleeping because you cannot get to sleep within 30 minutes?". The PSQI can be divided into seven subscales; subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. Each is rated from 0 – 3, with 0 indicating 'no difficulty' and 3 indicating 'severe difficulty'. A global score of 0-21 can also be calculated where higher scores indicate poorer sleep quality.

The PSQI has been used regularly in adolescent samples and has been found to have good internal reliability in this population (α = 0.72; De la Vega et al., 2015) and validity to discriminate between 'good' and 'poor' sleepers (Buysse et al., 1989).

A reliability analysis was performed on the PSQI. Cronbach's alpha coefficient results indicated the PSQI has moderate to high reliability and internal consistency (α = 0.78).

Sleep Effort

Glasgow Sleep Effort Scale (GSES; Broomfield & Espie, 2005). The GSES is a 7-item self-report questionnaire measuring sleep effort. Items include "I feel I should be able to control my sleep". The tool is a Likert-type scale with responses ranging from 'very much', 'to some extent' and 'not at all'. The tool uses a cut-off score of two where participants who are 'low effort' sleepers score 0, 1 or 2, and 'high effort' sleepers score three or more. In a sample of 89 adults, a mean score of 7.06 (SD = 3.58) was found for those with insomnia, compared with a mean score of 1.22 (SD = 1.35) for those classified as 'good sleepers' without insomnia (Broomfield & Espie, 2005).

In the adult literature, this measure has shown good internal consistency on overall scale scores (α = 0.79; Meia-Via et al., 2016), and in an insomnia patient group (α = 0.77; Broomfield & Espie, 2005). The GSES has been found to adequately discriminate between insomnia sufferers and good sleepers and has good concurrent validity with the Dysfunctional Beliefs and Attitudes Towards Sleep scale (r = 0.50; Broomfield & Espie, 2005). The GSES has yet to be adapted for adolescent usage. However, the questions were deemed appropriate to be used with a sample of 16–18-year-olds.

A reliability analysis was performed on the GSES comprising 7 items. Cronbach's alpha coefficient results indicated the GSES has moderate to high reliability and internal consistency (α = 0.70).

Beliefs About Sleep

Dysfunctional Beliefs About Sleep Scale for use with Children (DBAS-C10; Blunden et al., 2013). The DBAS-C10 is a 10-item self-report questionnaire designed to identify and assess various sleep/insomnia-related cognitions (e.g., beliefs, attitudes, expectations, appraisals, attributions). Items include "I must always have at least 9 hours sleep to function well or do well during the day". The DBAS-C10 is rated on a scale from 1 (strongly disagree) to 5 (strongly agree), where higher scores indicate higher dysfunctional beliefs.

The DBAS-C10 was adapted based on the original 10-item adult version (Edinger & Wohlgemuth, 2001). The DBAS-10 has been found to have respectable internal consistency and can effectively discriminate normal sleepers from insomnia sufferers (Edinger & Wohlgemuth, 2001). The DBAS-C10 has shown good internal consistency ($\alpha = 0.71$) and the test-retest reliability suggested consistency of responses (Blunden et al., 2013).

A reliability analysis was performed on the DBAS-C10 comprising 10 items. Cronbach's alpha coefficient results indicated the DBAS-C10 has moderate to high reliability and internal consistency ($\alpha = 0.74$).

Sleep Anticipatory Anxiety

Sleep Anticipatory Anxiety Questionnaire-Adolescent Version (SAAQ-A; Bootzin et al., 1994). The original SAAQ is a 10-item self-report tool of five questions surrounding somatic symptoms (e.g., "My muscles are tense") and five surrounding specific sleep-related cognitions (e.g., "I can't stop my mind racing"). The SAAQ has been adapted for an adolescent population (SAAQ-A) which includes five additional questions surrounding non-sleep rehearsal and planning cognitions (e.g., ''I can't stop thinking about what happened during the day''; Hiller et al., 2014). This subscale was included given research has found evidence for these pre-sleep thoughts in both adults and children with

insomnia (Wicklow & Espie, 2000; Gregory et al., 2009). This now 15-item self-report scale provides respondents with four response options from 0 (strongly disagree) to 3 (strongly agree). Higher scores suggest higher sleep anticipatory anxiety.

The SAAQ-A has been used in adolescent samples (Dohnt et al., 2012; Hiller et al., 2014) and has shown good internal consistency, comparable to the original 10-item scale (α = 0.84). The three subscales also show acceptable reliability (somatic, α = 0.80; sleep cognitions, α = 0.82; planning and rehearsal, α = 0.84; Hiller et al.).

A reliability analysis was performed on the SAAQ-A comprising 15 items. Cronbach's alpha coefficient results indicated the SAAQ-A has high reliability and internal consistency (α = 0.90).

Procedure

Data collection occurred between January-September 2020, during school term. Sleep survey completion involved (1) participants receiving participant information sheets explaining the full details of the study, (2) completion of informed consent, (3) completion of the demographic's questionnaire, (4) completion of the sleep questionnaires, (5) providing participants with a brief signposting debrief sheet. After completion, schools were circulated a 40-minute sleep webinar developed and delivered by author AS and second author (HC) based on CBT-I principles to thank schools for participation in the study.

Statistical Analyses

This study design employed a correlational analysis exploring intercorrelations between eight different variables: ISI, PSQI, GSES, DBAS, SAAQ-Total and three SAAQ subscales (Somatic, Sleep Cognitions, Planning/Rehearsal Cognitions). There was minimal missing data (one-two items maximum) in the sample with regards to sleep measures (5.28%). Missing data was managed statistically using list-wise deletion in the Statistical Package for the Social Sciences-Version 25 (SPSS-v25), which was used for all analyses.

Prior to analyses, continuous data were screened in relation to the assumptions of parametric tests. As not all assumptions were met, all analyses were conducted using a bootstrapping procedure, as this method is robust to violations of assumptions and does not require a large sample size. A resample procedure of 1000 bootstrap samples was employed.

Means and standard deviations were calculated for descriptive purposes. A reliability analysis using Cronbach's Alpha was performed to assess the internal reliability of the questionnaires. A series of two-tailed Pearson R correlational analyses were performed to explore any associations and significance between each of the variables. Finally, an independent t-test with two groups was conducted to explore whether there was a significant difference in mean scores on the ISI for young people who self-reported they would like help for their sleep compared to those who self-reported they would not. The level of statistical significance was set at 0.05.

Post-hoc power calculations conducted in G*Power (Version 3.1) indicated with the current sample, a power of 97% was achieved to detect a medium effect size ($r = 0.4$). A larger sample would have been needed to detect smaller effects.

Results

Sample Characteristics

Overall, there were a total of 40 (61.54%) participants within the 'no clinically significant insomnia' range, 19 (29.23%) within the 'subthreshold' range, 5 (7.69%) within the 'moderate severity' range and 1 (1.54%) within the 'severe' range on the ISI. There were 40 (61.54%) participants who scored over 5 on the PSQI, indicating poor overall sleep quality. The average sleep duration of the sample was 6.58 (SD = 1.77). Regarding the PSQI subscales, the average sleep disturbance was 1.05 (SD = 0.99), indicating overall the sample was disturbed by their sleep 'less than once a week' over the past month. The average daytime dysfunction was 1.41 (SD = 0.86), indicating overall the sample's ability to function during the day was impaired between 'once or twice' and 'once or twice each

week' over the past month. The average sleep latency was 1.52 (SD = 1) indicating the time it took for the sample to fall asleep was between '16-30 minutes' and '31-60 minutes' over the past month. The total means and standard deviations of the sample are shown in Table 2. There were no significant gender differences on any of the sleep measures.

Table 2

Means and standard deviations of sleep measures (n = 65)

Sleep measure	M (SD)
Pittsburgh Sleep Quality Index - Global Score	6.98 (3.85)
Insomnia Severity Index	6.98 (5.19)
Dysfunctional Beliefs and Attitudes about Sleep	25.68 (6.48)
Sleep Anticipatory Anxiety Questionnaire (Total)	15.80 (8.23)
Sleep Anticipatory Anxiety Questionnaire (Somatic Subscale)	4.03 (2.83)
Sleep Anticipatory Anxiety Questionnaire (Sleep Cognition Subscale)	5.25 (3.47)
Sleep Anticipatory Anxiety Questionnaire (Planning/Rehearsal Subscale)	6.52 (3.3)
Glasgow Sleep Effort Scale	2.94 (2.28)

Note. The mean ISI score for the sample was 6.98 (SD = 5.19), indicating overall participants were in the 'no clinically significant insomnia' range (Morin et al., 2011). The mean PSQI total score for the sample was 6.98 (SD = 3.85), indicating overall participants had poor sleep quality, with 5 being the cut-off (Buysse et al., 1989).

Inter-Correlational Analyses

A Pearson's correlation with bootstrapping (1000 samples) was performed to assess the relationships between adolescents' subjective insomnia severity (ISI), sleep quality (PSQI), sleep effort (GSES), dysfunctional beliefs about sleep (DBAS), and sleep anticipatory anxiety (SAAQ) with three subscales.

RQ1. Is there a relationship between adolescents' subjective insomnia severity and sleep effort?

As shown in Table 3, Pearson's corelations indicate (1) a small to medium, positive correlation between sleep effort (GSES) and overall sleep quality (PSQI), (2) a medium to large positive correlation between sleep effort (GSES) and insomnia severity (ISI).

RQ2. Is there a relationship between adolescents' subjective insomnia severity and dysfunctional beliefs and attitudes about sleep?

As shown in Table 3, Pearson's correlations demonstrate a small positive correlation between dysfunctional beliefs about sleep (DBAS) and insomnia severity (ISI).

RQ3. Is there a relationship between adolescents' subjective insomnia severity and sleep anticipatory anxiety?

As shown in Table 3, Pearson's correlations indicate (1) a medium, positive correlation between total sleep anticipatory anxiety (SAAQ-T) and overall sleep quality (PSQI), (2) a medium to large positive correlation between total sleep anticipatory anxiety (SAAQ-T), and insomnia severity (ISI). Additional correlations performed on the three subscales of the SAAQ found medium positive correlations between subjective insomnia severity (ISI) and the sleep cognition ($r\ (63) = .35$, $p < 0.001$, 95% CI [.14, .60) and planning/rehearsal ($r\ (63) = .39$, $p < 0.001$, 95% CI [.16, .62]) subscales, and a large positive correlation between insomnia severity (ISI) and the somatic cognition subscale ($r\ (63) = .50$, $p < 0.001$, 95% CI [.33, .75]).

Table 3

Inter-correlations between Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), Dysfunctional Beliefs About Sleep (DBAS), Sleep Anticipatory Anxiety (SAAQ) and Glasgow Sleep Effort Scale (GSES)

Measure	PSQI		ISI		DBAS		SAAQ	
	r	95% CI	*r*	95% CI	*r*	95% CI	*r*	95% CI
PSQI	-							
ISI	.74**	[.57, .91]	-					
DBAS	.21	[-.04, .46]	.24**	[.00, .49]	-			
SAAQ	.32**	[.1, .58]	.48**	[.28, 72]	.41**	[.19, .65]	-	
GSES	.25*	[.05, .53]	.46**	[.27, .71]	.40**	[.18, .64]	.47**	[.27. .71]

Note. ** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed), *r* = 0.10 (small), 0.30 (medium), 0.50 (large). 95% CI refers to the bootstrapped confidence intervals for the Pearson R (*r*) correlations.

Mean Difference in Two Groups

RQ4. Is there a difference in subjective insomnia severity between young people who report they would like help for their sleep compared with young people who report they would not like help for their sleep?

An independent t-test (95% CI) with bootstrapping (1000 samples) was performed to assess whether there was a significant mean difference in subjective insomnia severity between young people who report they would like help for their sleep compared with young people who report they would not like help for their sleep. There was no significant difference in subjective insomnia severity (ISI) between those who did and did not want help for their sleep; t (63) = .07, p = .781.

Discussion

The findings of this study suggest adolescents in the sample are not getting the recommended 9–9.25 hours of sleep (Short et al., 2018), and instead are averaging 6.58 hours per night over the past month. Additionally, this study shows that many adolescents suffer from poor overall sleep quality, yet insomnia, in turn, is less common. Correlational analyses show subjective insomnia severity and sleep quality are associated with different constructs involved in the maintenance and development of insomnia. More specifically, sleep effort and sleep anticipatory were associated most strongly with subjective insomnia severity, rather than subjective sleep quality. There were no between-group differences in self-reported insomnia severity for those who stated they would like help for their sleep compared to those who stated they would not like help for their sleep.

Regarding sleep effort, the mean found in this adolescent sample indicates participants were ‘high effort sleepers’, with three being the threshold (Broomfield & Espie, 2005). Additionally, the association between subjective insomnia severity and sleep effort was strongly correlated. This represents the first ever demonstration of elevated sleep effort associated with subjective insomnia severity and sleep quality in an adolescent

population. The results reflect previous association research which found a medium correlation between subjective insomnia and sleep effort in a sample of adults (Hertenstein et al., 2015). Our findings therefore provide preliminary evidence to suggest the association between sleep effort and insomnia severity may present similarly to adults. This may support models of adult insomnia which suggest attempts to control sleep or highly effortful sleep inversely has the paradoxical effect and consequently perpetuates insomnia (Broomfield & Espie, 2005; Espie et al 2006).

Regarding sleep anticipatory anxiety, our findings differ to those found in a large Australian adolescent school sample (Heath et al., 2018). Heath and colleagues (2018) only found one small positive correlation between subjective sleep diary 'Sleep Onset Latency' and the sleep cognitions subscale on the SAAQ-A. This differs to our findings which found medium to large correlations between subjective insomnia severity and the total and each individual subscale of the SAAQ-A. The difference in findings may be attributed to the different sleep measures used. Additionally, previous research included the item 'planning/rehearsal' in the measure of sleep anticipatory anxiety given this has been found to precede poor sleep in both adults and adolescents (Wicklow & Espie, 2000; Gregory et al., 2009). This study confirms this association where the planning/rehearsal subscale was moderately positively correlated with subjective insomnia severity. These findings support cognitive models of insomnia which suggest anticipatory anxiety about sleep is associated with insomnia (Harvey, 2002).

A small correlation was found between dysfunctional beliefs and attitudes about sleep and insomnia severity, yet no correlation was found with sleep quality. This differs to previous research which found a small correlation between overall sleep quality and dysfunctional beliefs and attitudes about sleep in a large sample of Chinese college students (Jin et al., 2018). The differences in findings may be attributed to our small sample size, where a larger sample may be needed to detect smaller effects.

This current study found there was no difference in insomnia symptoms between those who reported they wanted help for their sleep compared to those who did not. This differs from previous research which explored brief sleep interventions in schools and found those who indicated they would like help for their sleep had significantly more sleeping difficulties (Paavonen et al., 2016). The differences in findings could be related to the differing sleep measures used or the small sample size in our study. The differences could also be related to most of our sample being male, given research has found young males are less likely to seek help for mental health difficulties than females (Rickwood, Deane & Wilson, 2007).

Limitations

There are several limitations to this study which are important to discuss. Given recruitment constraints, the sample size is small and most of the participants were male students studying a sports related qualification. This makes it difficult to draw firm conclusions on the prevalence of sleep difficulties in the general adolescent population, as well as the relationships between different sleep variables. Participants were drawn from a community sample, impacting the generalisability to those experiencing mental health difficulties. The measures of sleep quality and insomnia severity were subjective in nature, therefore further research may benefit from including objective measures of sleep such as actigraphy to further validate the results. No measure of sleep effort exists for the adolescent population, therefore potentially impacting the validity of the findings. The findings provide preliminary evidence to suggest the GSES is reliable for use with adolescents, yet investigation is warranted with larger samples. Given the correlational nature of this research, inferences cannot be made about causation. Moreover, despite the research providing preliminary evidence of associations between different sleep-related thought processes, due to the nature of the study being completed at one point in time, an exploration of the interaction between these variables was not explored.

Whilst there are limitations, this study provides preliminary evidence to suggest subjective insomnia severity is associated with sleep-related thought processes in a sample of adolescents. The association found between sleep effort and subjective insomnia severity is the first exploration in adolescents. Our preliminary findings provide clinical implications and a basis for further exploration of these constructs in the adolescent population.

Clinical Implications

Results of this study provide possible clinical implications. The findings may provide support for the use of CBT-I in adolescents, given cognitive components of this therapy target sleep-related thought processes by breaking vicious cycles using techniques such as challenging unhelpful thoughts and beliefs. Similarly, adolescents who have high sleep anticipatory anxiety and high sleep effort, might be suited to Paradoxical Intention therapy for insomnia. This behavioural intervention aims to reduce performance anxiety about sleep by encouraging patients to do the opposite (Turner & Ascher, 1979). Therefore, it may be important to screen for sleep anticipatory anxiety and sleep effort to help identify poor sleepers and guide therapeutic approaches.

Moreover, given CBT-I mainly targets perpetuating factors, including processes like sleep effort through Paradoxical Intention, it would be useful to understand if sleep effort changes after a period of CBT-I in the adolescent population. Furthermore. it could be helpful to explore which components of CBT-I, such as challenging unhelpful thoughts or beliefs about sleep or deploying Paradoxical Intention, led to any change in sleep effort. This would provide further insight into the mechanisms underlying adolescent insomnia.

Finally, research has found poor sleep associates with poor mental health in younger people (Pasch et al., 2010; Gradisar et al., 2008) and sleep interventions may be portrayed as less stigmatising than those targeting anxiety or depression (Blake et al., 2017). Therefore, our preliminary findings along with further scale validation and

treatment research, may provide a viable sleep-based care pathway to improve the wellbeing of younger people.

Conclusions

In summary, this study investigating relationships between subjective insomnia severity, sleep quality and sleep-related thought processes in adolescents indicates that (a) increased sleep effort was associated with increased insomnia severity and poorer sleep quality in adolescents, (b) increased sleep anticipatory anxiety was associated with increased insomnia severity and poorer sleep quality in adolescents, (c) increased dysfunctional beliefs and attitudes about sleep were associated with increased insomnia severity in adolescents.

Future Research

- Future research would benefit from investigating how different sleep-related thought process variables interact to inform the theoretical understanding of models of insomnia in adolescents
- Future intervention research would benefit from obtaining measures of sleep-related thought processes to decipher differences pre-post treatment and establish the longer-term effects in adolescents
- Future research would benefit from further validating the SAAQ-A and GSES in adolescents
- Future research could explore the potential of adapting Paradoxical Intention therapy for adolescents

References

Bartel, K. A., Gradisar, M., & Williamson, P. (2015). Protective and risk factors for adolescent sleep: a meta-analytic review. *Sleep medicine reviews*, *21*, 72-85. https://doi.org/10.1016/j.smrv.2014.08.002

Bastien, C. H., Vallières, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep medicine*, *2*(4), 297-307. https://doi.org/10.1016/S1389-9457(00)00065-4

Blake, M. J., Sheeber, L. B., Youssef, G. J., Raniti, M. B., & Allen, N. B. (2017). Systematic review and meta-analysis of adolescent cognitive–behavioral sleep interventions. Clinical child and family psychology review, 20(3), 227-249. https://doi.org/10.1007/s10567-017-0234-5

Blake, M. J., Trinder, J. A., & Allen, N. B. (2018). Mechanisms underlying the association between insomnia, anxiety, and depression in adolescence: implications for behavioral sleep interventions. *Clinical psychology review*, *63*, 25-40. https://doi.org/10.1016/j.cpr.2018.05.006

Blunden, S., Crawford, M., & Gregory, A. (2013). Development of a short version of the Dysfunctional Beliefs about Sleep Questionnaire for use with Children (DBAS-C10). CQUniversity. Journal contribution. https://hdl.handle.net/10018/985462

Bootzin, R., Shoham, V., & Kuo, T. (1994). Sleep anticipatory anxiety questionnaire: a measure of anxiety about sleep. *Sleep Res*, *23*, 188.

Broomfield, N. M., & Espie, C. A. (2005). Towards a valid, reliable measure of sleep effort. *Journal of sleep research*, *14*(4), 401-407. https://doi.org/10.1111/j.1365-2869.2005.00481.x

Buysse, D. J., Reynolds III, C. F., 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

Carskadon, M. A. (2011). Sleep in adolescents: the perfect storm. *Pediatric Clinics*, *58*(3), 637-647. https://doi.org/10.1016/j.pcl.2011.03.003

Carskadon, M. A., & Acebo, C. (2002). Regulation of sleepiness in adolescents: update, insights, and speculation. *Sleep*, *25*(6), 606-614. https://doi.org/10.1093/sleep/25.6.606

de la Vega, R., Tomé-Pires, C., Solé, E., Racine, M., Castarlenas, E., Jensen, M. P., & Miró, J. (2015). The Pittsburgh Sleep Quality Index: Validity and factor structure in young people. *Psychological Assessment*, *27*(4), e22. https://psycnet.apa.org/doi/10.1037/pas0000128

Dohnt, H., Gradisar, M., & Short, M. A. (2012). Insomnia and its symptoms in adolescents: comparing DSM-IV and ICSD-II diagnostic criteria. *Journal of Clinical Sleep Medicine*, *8*(3), 295-299. https://doi.org/10.5664/jcsm.1918

Edinger, J. D., & Wohlgemuth, W. K. (2001). Psychometric comparisons of the standard and abbreviated DBAS-10 versions of the dysfunctional beliefs and attitudes about sleep questionnaire. Sleep medicine, 2(6), 493-500. https://doi.org/10.1016/S1389-9457(01)00078-8

Espie, C. A., Broomfield, N. M., MacMahon, K. M., Macphee, L. M., & Taylor, L. M. (2006). The attention–intention–effort pathway in the development of psychophysiologic insomnia: a theoretical review. *Sleep medicine reviews*, *10*(4), 215-245. https://doi.org/10.1016/j.smrv.2006.03.002

Fuligni, A. J., & Hardway, C. (2006). Daily variation in adolescents' sleep, activities, and psychological well-being. *Journal of Research on Adolescence*, *16*(3), 353-378. https://doi.org/10.1111/j.1532-7795.2006.00498.x

Fuligni, A. J., Bai, S., Krull, J. L., & Gonzales, N. A. (2019). Individual differences in optimum sleep for daily mood during adolescence. *Journal of Clinical Child &*

Adolescent Psychology, *48*(3), 469-479. https://doi.org/10.1080/15374416.2017.1357126

Gradisar, M., Gardner, G., & Dohnt, H. (2011). Recent worldwide sleep patterns and problems during adolescence: a review and meta-analysis of age, region, and sleep. Sleep medicine, 12(2), 110-118. https://doi.org/10.1016/j.sleep.2010.11.008

Gradisar, M., Terrill, G., Johnston, A., & Douglas, P. (2008). Adolescent sleep and working memory performance. *Sleep and Biological Rhythms*, *6*(3), 146-154. https://doi.org/10.1111/j.1479-8425.2008.00353.x

Gregory, A. M., Cox, J., Crawford, M. R., Holland, J., Haravey, A. G., & Steps Team. (2009). Dysfunctional beliefs and attitudes about sleep in children. *Journal of sleep research*, *18*(4), 422-426. https://doi.org/10.1111/j.1365-2869.2009.00747.x

Harvey, A. G. (2002). A cognitive model of insomnia. *Behaviour research and therapy*, *40*(8), 869-893. https://doi.org/10.1016/S0005-7967(01)00061-4

Heath, M., Johnston, A., Dohnt, H., Short, M., & Gradisar, M. (2018). The role of pre-sleep cognitions in adolescent sleep-onset problems. *Sleep medicine*, *46*, 117-121. https://doi.org/10.1016/j.sleep.2018.03.002

Hertenstein, E., Nissen, C., Riemann, D., Feige, B., Baglioni, C., & Spiegelhalder, K. (2015). The exploratory power of sleep effort, dysfunctional beliefs and arousal for insomnia severity and polysomnography-determined sleep. Journal of sleep research, 24(4), 399-406. https://doi.org/10.1111/jsr.12293

Hiller, R. M., Lovato, N., Gradisar, M., Oliver, M., & Slater, A. (2014). Trying to fall asleep while catastrophising: what sleep-disordered adolescents think and feel. *Sleep medicine*, *15*(1), 96-103. https://doi.org/10.1016/j.sleep.2013.09.014

Jin, L., Zhou, J., Peng, H., Ding, S., & Yuan, H. (2018). Investigation on dysfunctional beliefs and attitudes about sleep in Chinese college students. *Neuropsychiatric disease and treatment*, *14*, 1425. https://dx.doi.org/10.2147%2FNDT.S155722

Johnson, E. O., Roth, T., Schultz, L., & Breslau, N. (2006). Epidemiology of DSM-IV insomnia in adolescence: lifetime prevalence, chronicity, and an emergent gender difference. *Pediatrics*, *117*(2), e247-e256. https://doi.org/10.1542/peds.2004-2629

Meia-Via, M. S., Marques, D. R., Espie, C. A., da Silva, C. F., & Allen Gomes, A. (2016). Psychometric properties of Glasgow Sleep Effort Scale in Portuguese language. *Psychological assessment*, *28*(3), e12. https://psycnet.apa.org/doi/10.1037/pas0000178

Morin, C. M., Vallières, A., & Ivers, H. (2007). Dysfunctional beliefs and attitudes about sleep (DBAS): validation of a brief version (DBAS-16). Sleep, 30(11), 1547-1554. https://doi.org/10.1093/sleep/30.11.1547

Morin, C. M., Belleville, G., Bélanger, L., & Ivers, H. (2011). The Insomnia Severity Index: psychometric indicators to detect insomnia cases and evaluate treatment response. *Sleep*, *34*(5), 601-608. https://doi.org/10.1093/sleep/34.5.601

Pasch, K. E., Laska, M. N., Lytle, L. A., & Moe, S. G. (2010). Adolescent sleep, risk behaviors, and depressive symptoms: are they linked?. *American journal of health behavior*, *34*(2), 237-248. https://doi.org/10.5993/AJHB.34.2.11

Paavonen, E. J., Huurre, T., Tilli, M., Kiviruusu, O., & Partonen, T. (2016). Brief behavioral sleep intervention for adolescents: an effectiveness study. Behavioral sleep medicine, 14(4), 351-366. https://doi.org/10.1080/15402002.2015.1007993

Rickwood, D. J., Deane, F. P., & Wilson, C. J. (2007). When and how do young people seek professional help for mental health problems?. *Medical journal of Australia*, *187*(S7), S35-S39. https://doi.org/10.5694/j.1326-5377.2007.tb01334.x

Short, M. A., Weber, N., Reynolds, C., Coussens, S., & Carskadon, M. A. (2018). Estimating adolescent sleep need using dose-response modeling. *Sleep*, *41*(4), zsy011. https://doi.org/10.1093/sleep/zsy011

Sivertsen, B., Harvey, A. G., Lundervold, A. J., & Hysing, M. (2014). Sleep problems and depression in adolescence: results from a large population-based study of

Norwegian adolescents aged 16–18 years. *European child & adolescent psychiatry*, *23*(8), 681-689. https://doi.org/10.1007/s00787-013-0502-y

Turner, R. M., & Ascher, L. M. (1979). Controlled comparison of progressive relaxation, stimulus control, and paradoxical intention therapies for insomnia. Journal of Consulting and Clinical Psychology, 47(3), 500. https://psycnet.apa.org/doi/10.1037/0022-006X.47.3.500

Veqar, Z., & Hussain, M. E. (2017). Validity and reliability of insomnia severity index and its correlation with pittsburgh sleep quality index in poor sleepers among Indian university students. *International journal of adolescent medicine and health*, *32*(1). https://doi.org/10.1515/ijamh-2016-0090

Warner, S., Murray, G., & Meyer, D. (2008). Holiday and school-term sleep patterns of Australian adolescents. *Journal of adolescence*, *31*(5), 595-608. https://doi.org/10.1016/j.adolescence.2007.10.005

Werner-Seidler, A., Wong, Q., Johnston, L., O'Dea, B., Torok, M., & Christensen, H. (2019). Pilot evaluation of the Sleep Ninja: a smartphone application for adolescent insomnia symptoms. *BMJ open*, *9*(5), e026502. http://dx.doi.org/10.1136/bmjopen-2018-026502

Wicklow, A., & Espie, C. A. (2000). Intrusive thoughts and their relationship to actigraphic measurement of sleep: towards a cognitive model of insomnia. *Behaviour research and therapy*, *38*(7), 679-693. https://doi.org/10.1016/S0005-7967(99)00136-9

World Health Organization. (2015). Maternal, new born, child and adolescent health. Retrieved from: WHO | Health for the world's adolescents

Wolfson, A. R., & Carskadon, M. A. (1998). Sleep schedules and daytime functioning in adolescents. Child development, 69(4), 875-887. https://doi.org/10.1111/j.1467-8624.1998.tb06149.x

Chapter 5. Additional Chapter: Extended Methodology and Additional Results

This chapter reports additional methodology and results for the meta-analysis and the empirical research project. For the meta-analysis, regarding methodology this includes further detail on what was captured in the data extraction spreadsheet, searches, calculating Cohen's d effect sizes and MAVIS (Meta-Analysis via Shiny Version 1.1.2) Software. Regarding results, additional detail for the quality checklist and outputs from the sensitivity analyses are presented.

For the empirical paper, regarding methodology, additional information is provided on the procedure and data analysis. Regarding results, the full inter-correlational matrix is presented.

Meta-analysis

This section provides further details of the methodology used for the meta-analysis and additional results.

Extended Methods

Data Extraction Spreadsheet

An Excel spreadsheet was created for the purposes of data extraction. This recorded study information including study characteristics (authors, title, year of publication), intervention type, mode of delivery (group or individual), research design, psychiatric and physical comorbidities, anxiety measure used/diagnostic interview used, sleep-related thought measure used, objective/subjective sleep quality measure used, size of intervention and control groups, baseline and outcome data for anxiety and sleep related-thought processes (means, standard deviations, effect sizes).

Database Searches

The database searches were run on two occasions to ensure any newly published studies were captured. This included the initial search in October 2020, and then again late

January 2021. When the search was re-run, two additional studies were found and included in the review.

Calculating Effect Sizes When *d* Was Not Reported

Some studies did not report means and standard deviations, therefore every attempt was made to calculate effect sizes from available data. This meant converting data available to Cohen's *d* effect sizes. All conversions were conducted in Excel using formulae for Cohen's *d*. When a mean and standard error was reported, a standard deviation was calculated using excel formulae available from Cochrane: 16.1.3 Missing standard deviations (cochrane.org). This data was then subsequently converted into an effect size. Care was taken to ensure the direction of the effect was accounted for. This meant searching the scoring procedures for several anxiety outcome measures to understand whether a decrease in scores was positive or negative.

MAVIS Software

MAVIS was opted for use over other meta-analysis software as this supports random effects models, effect size calculators and methods for detecting publication bias. This software also allowed for the results of the meta-analysis to be presented as a 'forest plot' (Lewis & Clarke, 2001).

Additional Results

Quality Checklist

As discussed in the methodology and presented in the results in Chapter 2, a quality assessment was conducted for each study included in the meta-analysis using the Cochrane Risk of Bias Tool-Version 2 (Sterne et al., 2019). An automated Excel spreadsheet was utilised for the purposes of this quality assessment. A discrepancy check was performed using this spreadsheet to provide reliability in the results. A more detailed presentation of the risk of bias in each study is presented in Figure 1. For the purposes of this figure, a green circle represents 'Low Risk', a yellow circle represents 'Some Concerns' and a red

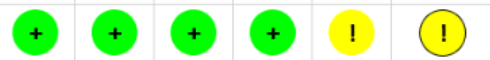
circle indicates ‘High Risk’. ‘D1’ refers to the randomisation process, ‘D2’ refers to deviations from the intended interventions, ‘D3’ refers to missing outcome data, ‘D4’ refers to measurement of the outcome, and ‘D5’ refers to selection of the reported result.

Figure 1

Quality checklist of included studies in the meta-analysis (n = 43)

Unique ID	Study ID	Experimental	Comparator	Outcome	Weight	D1	D2	D3	D4	D5	Overall
Casault et al., 2015	1	CBT-I	Control	HADS-A	1	+	+	+	+	!	!
Espie et al., 2014	2	CBT-I	TAU	DASS - Anxiety	1	+	!	+	+	!	-
Bergdahl et al., 2017	3	CBT-I	Auricular Acupuncture	HAD-A	1	+	!	+	+	-	-
Nguyen et al., 2017	4	CBT-I	TAU	HADS-A	1	+	+	+	+	!	!
McCrae et al., 2019	5	CBT-I	Waitlist Control	STAI - Y	1	+	+	+	+	!	+
Jansson-Frojmark et al., 2012	6	CBT-I	WLC	HADS-A	1	+	+	+	+	!	!
Sunhed et al., 2020	7	CT/BT	WLC	HADS-A	1	+	+	+	+	!	!
van der Zweerde et al., 2018	8	CBT-I	Control	HADS-A	1	+	+	+	+	!	!
McCrae et al., 2018	9	BBT-I	Self Monitoring Control	STAI-Y	1	+	+	+	+	!	!
Siengsukon et al., 2020	10	CBT-I	Active Control	GAD-7	1	!	!	+	+	!	-
Lancee et al., 2016	11	CBT-I	WLC	HADS-A	1	!	+	+	+	!	-
Taylor et al., 2018	12	CBT-I	Control	BAI	1	+	!	+	+	+	!
Ritterband et al., 2012	13	CBT-I	WLC	HADS-A	1	!	!	+	+	!	-
Morris et al., 2016	14	CBT-I	Control	STAI	1	+	+	+	+	!	!

Lancee et al., 2012	15	CBT-I	Control	HADS-A	1	!	!	+	+	!	-
Denis et al., 2020	16	CBT-I	Control	STAI	1	+	+	+	+	+	+
Black et al., 2015	17	Sleep hygiene	Mindfulness	BAI	1	+	+	+	+	!	!
Horsch et al., 2017	18	CBT-I	WLC	HADS-A	1	+	+	+	+	!	!
Harris et al., 2019	19	BBT-I	Sleep monitoring	HADS-A	1	+	+	+	+	+	+
Smitherman et al., 2016	20	CBT-i	Control	GAD-7	1	+	+	+	+	!	!
Thorndike et al., 2013	21	CBT-I	WLC	STPI-Trait anxiety	1	+	+	+	+	!	!
Lorenz et al., 2018	22	CBT-I	NA	BSI-Anxiety	1	!	+	+	+	!	-
Friedrich et al., 2018	23	CBT-I	WLC	PHQ-D - anxiety	1	+	!	+	!	!	-
McGrath et al., 2016	24	CBT-I	standard care	BAI	1	+	+	+	+	+	+
Lancee et al., 2015	25	CBT-I	WLC	HADS-A	1	!	+	+	!	!	-
Chapoutot et al., 2020	26	CBT-I/ACT-I	WLC	QoL - anxiety subscale	1	+	+	+	!	!	-
Gieselmann et al., 2019	27	Insomnia psychotherapy	WLC	STAI-T	1	+	+	+	!	!	-
Kyle et al., 2020	28	CBT-I	WLC	GAD-2	1	+	+	+	+	+	+
Batterham et al., 2017	29	CBT-I	Control	GAD-7	1	+	+	+	+	+	+

Matthews et al., 2014	30	CBT-I	Active control	HADS-A	1	
Rybarczyk et al., 2005	31	CBT-I	Waitlist control	BAI	1	
Blake et al., 2016	32	CBT-I	Passive Control	SCAS	1	
Huang et al., 2013	33	Light/Dark Exposure	Active Control	HADS-A	1	
Yeung., 2018	34	Sleep hygiene	Accupressure	HADS-A	1	
Carney & Waters, 2006	35	Contructive worry group	Worry group	STAI	1	
de Bruin et al., 2018	36	CBT-I	Group therapy/WLC	YSR	1	
Xing., 2020	37	CBT-I	Electroaccupunture	HAM-A	1	
Freeman et al., 2017	38	CBT-I	TAU	GAD-7	1	
Mimeault & Morin, 1999	39	BT	WLC	BAI	1	
Espie et al., 2008	40	CBT-I	TAU	HADS-A	1	
Ho et al., 2014	41	CBT-I	WLC	HADS-A	1	
Van der Zweerde et al., 2020	42	CBT-I	CAU	HADS-A	1	
Barati & Amini, 2020	43	Sleep hygiene	Active Control group	DASS	1	

Sensitivity Analyses

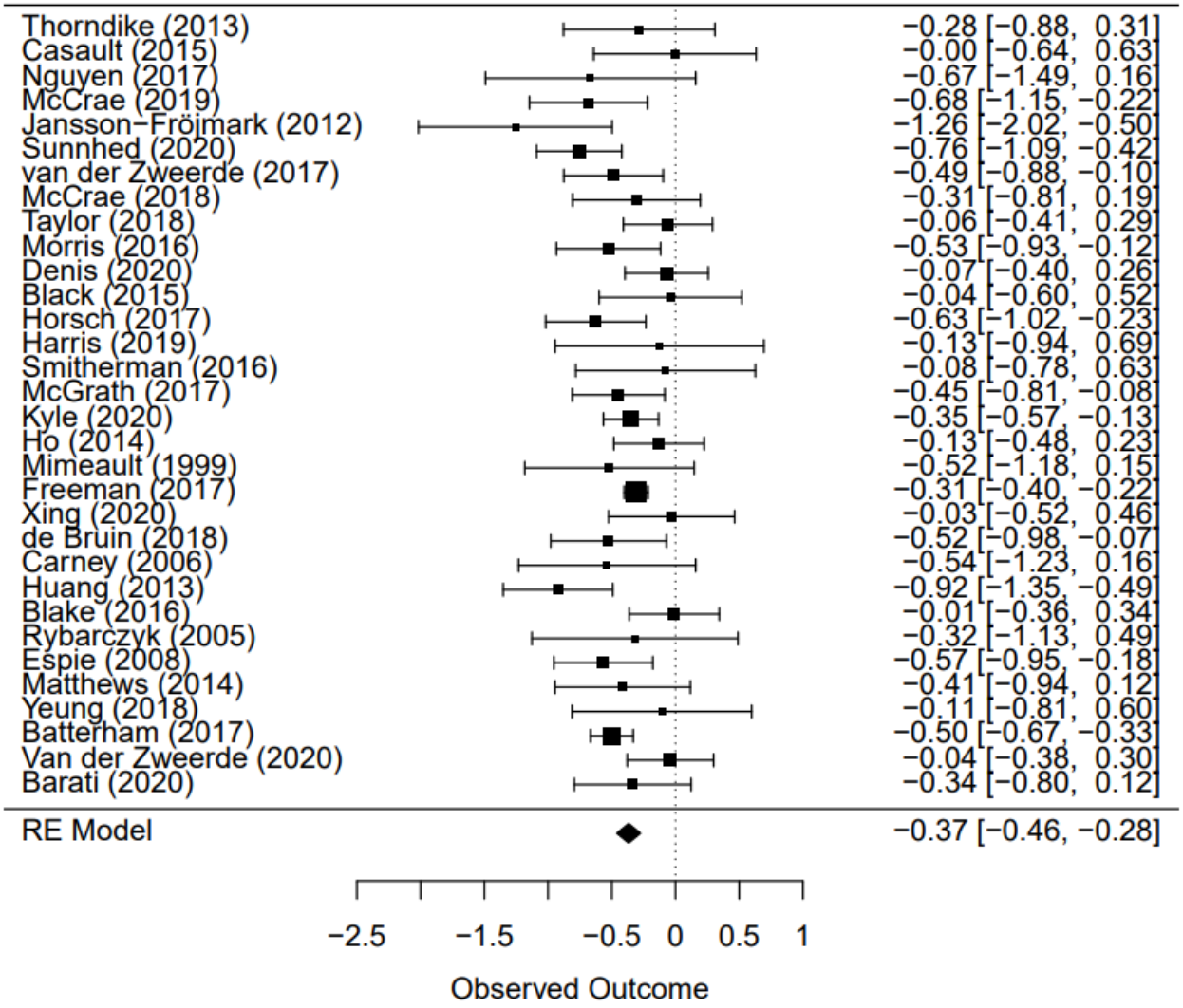
Two sensitivity analyses were conducted for the meta-analysis as discussed in the results section in Chapter 2. The outputs of the analyses are displayed in Figures 2 and 3. Sensitivity analyses aim to explore the robustness of the observed outcome to the assumptions made prior to performing the analysis (Bown & Sutton, 2010). There is no set method for performing a sensitivity analysis (Bown & Sutton). However, one method is to repeat the meta-analysis with an altered dataset to decipher whether these changes have an impact on the initial effect found in the analysis (Bown & Sutton). This is what was conducted in this meta-analysis, where low quality studies were removed in one analysis, and significant outliers (as per inspection of funnel plots) were removed in the second. This has been a recommended method in meta-analyses guidance (Cuijpers, 2016; Bowen & Sutton). Given there was little change in the overall outcome, as evidenced by minimal change in the effect size, the results show evidence of robustness (Bown & Sutton).

Sensitivity Analysis 1

Figure 2 provides the output from MAVIS for the sensitivity analysis where low quality studies were removed from the overall meta-analysis.

Figure 2

Sensitivity analysis with low quality studies removed

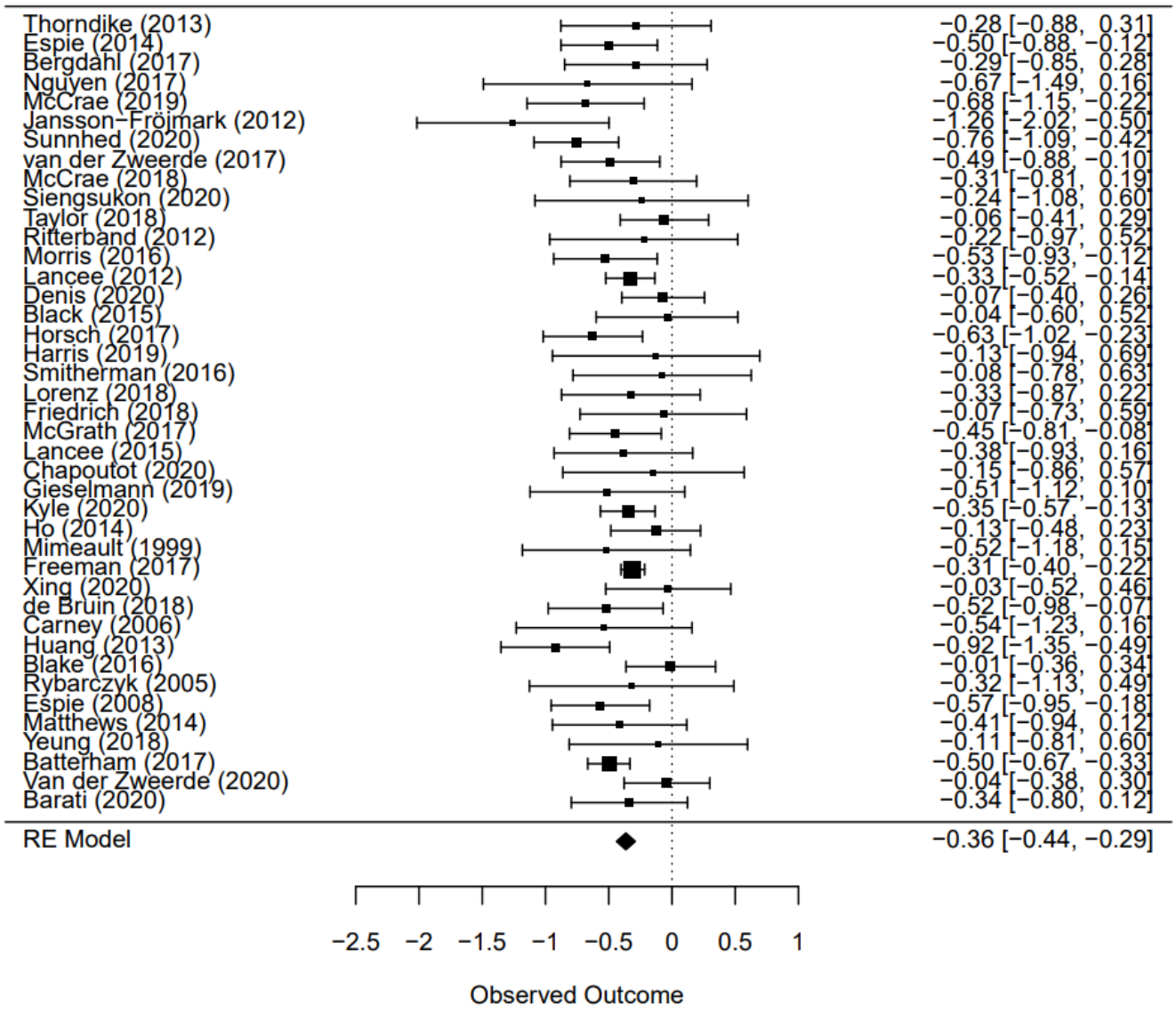


Sensitivity Analysis 2

Figure 3 provides the output from MAVIS for the sensitivity analysis where two outliers were removed from the overall meta-analysis.

Figure 3

Sensitivity analysis with outliers removed



Empirical Research Project

This section provides further details of the methodology used for the empirical research project and additional results.

Extended Methods

Design

This was a cross-sectional survey of self-reported insomnia severity and sleep-related thought processes.

Procedure

Recruitment

School senior leadership teams were contacted via email or phone to provide a brief overview of the research study. If schools were interested in participating, the researchers explained the aims of the study and requested permission to give information to their students via the school's preferred methods. Schools were offered a meeting with the researchers and staff team to discuss the study, to provide participant information sheets and answer questions. All plans for recruitment were finalised in collaboration with the schools.

Consent Process

Two weeks prior to the sleep survey, participant information sheets (Appendix F) were circulated to all potential participants. Participant information sheets were also available on the day of the questionnaire survey in schools. All participants who were willing to take part were asked to complete a Consent Form (Appendix G) which was signed with the researchers present before they accessed the questionnaires. If completing the questionnaire online, participants would also complete the consent form prior to accessing the questionnaires. Given we recruited only from sixth form/colleges and teachers had informed that all participants were over 16 years old (in years 12-13), they could self-consent to participate. The consent form included: the participant agreeing that they have read and understood the participant information sheet and that they give their informed consent to take part in the study; being made aware of their right to withdraw at any point by simply stopping the completion of the questionnaires; that if participants highlight any risk issues (e.g. suicidal ideation or self-harm), the school's named pastoral

care staff (or similar) will be notified so that they are able to offer or signpost students to appropriate support. This was done in line with the schools specific safeguarding policies.

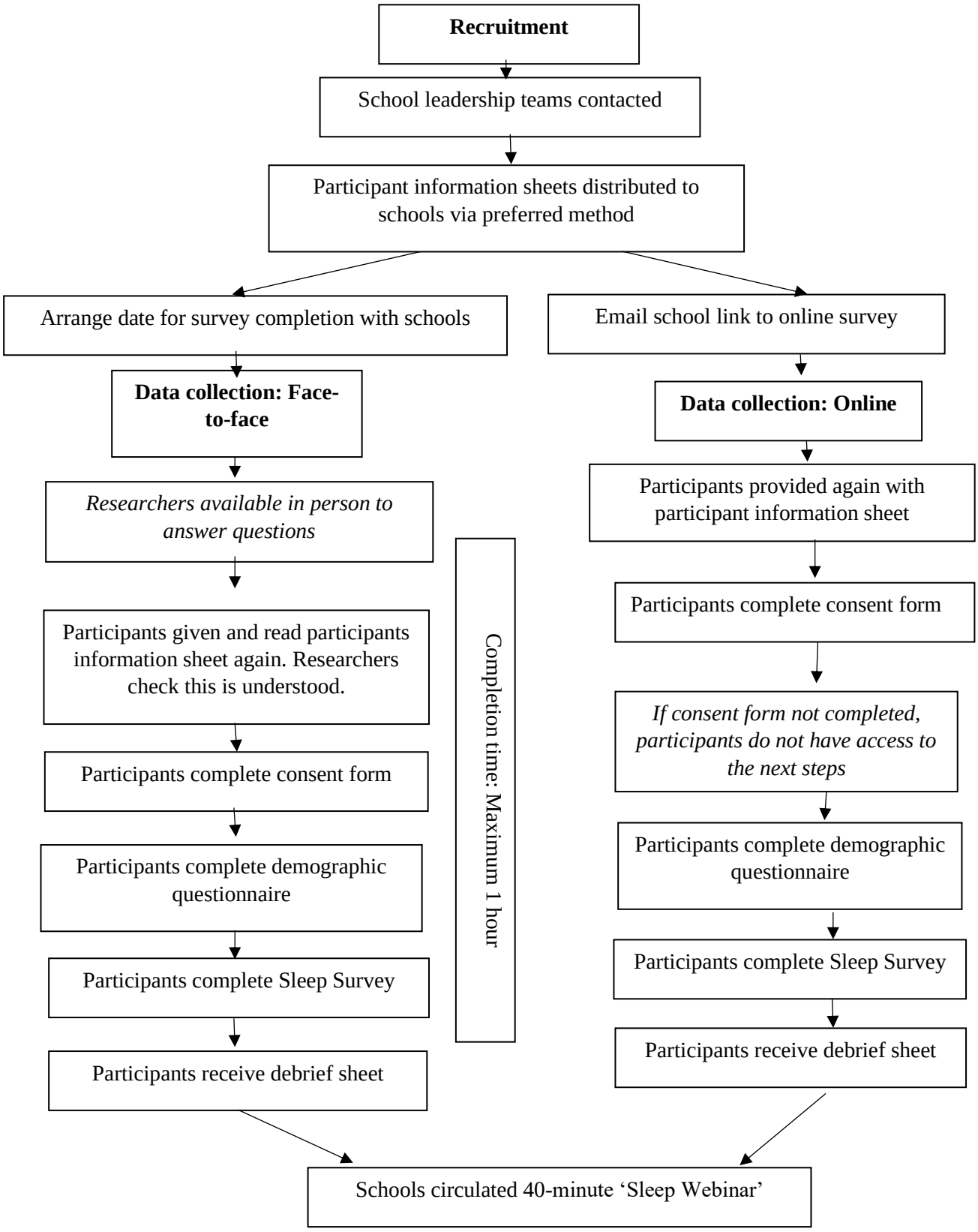
Participant consent forms and other identifiable information such as the demographic questionnaire were kept securely locked. All participant data used in the study was kept entirely anonymous using unique identifiers.

Data Collection

Data collection occurred during three face-to-face (approximately one hour) visits to two colleges between January-March 2020, during school term (63 completed questionnaires). Data collection also occurred online during May-September 2020 (three completed questionnaires). The online survey was created in JISC Software. The colleges who were interested preferred the questionnaires to be completed during a lesson which was relevant to the topic of 'Sleep'. This fortunately benefited the current curriculum being taught in both colleges. During face-to-face survey completion, (1) researchers talked through the participant information sheets to ensure participants understood what the study involved, (2) researchers obtained informed consent, (3) participants completed a demographics questionnaire, (4) participants completed a sleep survey, (5) participants were provided with a brief signposting debrief sheet. Figure 4 provides a flowchart of the procedure.

Figure 4

Procedure flow diagram



Note. 'Sleep Webinar'- the two schools who took part in this research were provided with a 40-minute Sleep webinar. This was delivered by author (AS) and second author of the empirical project (HC). The webinar comprised of a presentation discussing sleep tips based on Cognitive Behavioural Therapy for Insomnia (CBT-I) principles. For the presentation slides see Appendix P. For access to the full webinar, please contact main author, AS.

Data Analysis

Non-identifiable participant raw data was entered into a password protected spreadsheet. Variables were computed and data was transferred into the Statistical Package for the Social Sciences (SPSS; Version 25) for statistical analyses. Continuous data were screened in relation to the assumptions of parametric tests. Tests of normality were computed for each of the outcome variables using the Shapiro-Wilk test and inspection of histogram plots. The Shapiro-Wilk test was opted for as this is more appropriate for smaller sample sizes (Razali & Wah, 2011). Other than the Pittsburgh Sleep Quality Index (PSQI) and Glasgow Sleep Effort Scale (GSES), all tests were non-significant at the .05 level, indicating the data was normally distributed. Inspection of histogram plots supported these tests. As some assumptions were violated for two variables (the PSQI and GSES), confirmatory analyses were conducted by running analyses with 1000 bootstrap samples. The bootstrapping technique takes the original sample and resamples it to create many samples. This method is not reliant on assumptions and does not assume any underlying distribution of the data.

Additional Results

Full Inter-Correlational Analyses

Table 1 shows the full correlation matrix for the entire variables within the empirical research project. As shown in Table 1, additional positive correlations were found between the sleep-thought process variables themselves, including a medium to

large correlation found between the Dysfunctional Beliefs and Attitudes about Sleep Scale and the Sleep Anticipatory Anxiety total score. Additionally, the Glasgow Sleep Effort Scale was largely correlated with the ‘Sleep Cognitions’ subscale on the Sleep Anticipatory Anxiety Questionnaire. Moreover, ‘Sleep Latency’ which refers to the time it takes for a young person to fall asleep (with higher scores indicating longer sleep latency) was moderately correlated with the SAAQ-A and largely correlated with the GSES. This suggests anxious, high effort, adolescent sleepers, may take longer to get to sleep.

Table 1

Inter-correlations between all sleep variables

	PSQI	Sleep Latency	ISI	DBAS	SAAQ-Total	SAAQ-Somatic	SAAQ-Sleep Cognition	SAAQ- Planning/ Rehearsal
PSQI	-							
Sleep Latency	.69**	-						
ISI	.74**	.67**	-					
DBAS	.21	.16	.24**	-				
SAAQ-Total	.32**	.43**	.48**	.41**	-			
Somatic	.31	.45**	.50**	.27**	.84**	-		
Sleep Cognition	.25*	.42**	.35**	.45**	.85**	.58**	-	
Planning/rehearsal	.26*	.25*	.39**	.33**	.86**	.62**	.57**	-
GSES	.25*	.51**	.46**	.40**	.47**	.39**	.58**	.23

Note. ** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed); GSES = Glasgow Sleep Effort Scale; PSQI = Pittsburgh Sleep Quality Index; 'Sleep Latency' = PSQI Subscale; ISI = Insomnia Severity Index; DBAS = Dysfunctional Beliefs and Attitudes about Sleep Scale; SAAQ-T = Sleep Anticipatory Anxiety Questionnaire Total score; SAAQ Somatic = somatic subscale; SAAQ Sleep Cognition = sleep-related cognitions subscale; SAAQ Planning/rehearsal = rehearsal and planning cognitions subscale

Chapter 6. Additional Chapter: Planned Full Empirical Project

The Feasibility of Implementing a Brief Sleep Intervention for Adolescents with Insomnia Symptoms

This additional chapter outlines the initial full plan for the empirical research project. Initially, this project had two proposed stages; Stage 1 involved recruiting and screening participants face-to-face in schools with a Sleep Survey to assess eligibility for Stage 2, and Stage 2 involved participants receiving a brief-low intensity sleep intervention, the 'Sleeping Better Programme' (Orchard et al., 2020). This was to assess the feasibility of recruiting adolescents to a brief-sleep intervention in schools. Unfortunately, due to the impact of the COVID-19 pandemic, particularly with difficulties in moving the study completely to a digital format, only Stage 1 was feasible to be conducted which therefore provided cross-sectional survey data (Chapter 4) and some feasibility data (Chapter 7).

Regarding feasibility, of five schools contacted directly in the East of England, UK, two agreed to participate. Face-to-face recruitment was the preferred method. Barriers to recruitment included surveys distributed online, exams approaching and school holidays. There was some demand for the sleep intervention, with 51% of students who completed the Stage 1 survey reporting they would like help for their sleep.

This chapter outlines additional introductory research relevant to the planned full project, sample size considerations, recruitment constraints, planned aims and research questions and planned procedure.

Additional Introduction

National Institute of Clinical Excellence (NICE) recommends 'cognitive and behavioural interventions' alongside good sleep hygiene and exercise, for those aged 16 and over who have experienced insomnia for greater than four weeks (NICE, 2015). A

recent meta-analysis by Blake et al. (2017) exploring the efficacy of Cognitive Behavioural Therapy for Insomnia (CBT-I) in adolescents found improvements in depression, anxiety, and daytime sleepiness post-intervention. Sleep diary and actigraphy data also showed improvements in total sleep time, sleep efficiency and sleep onset latency (Blake et al., 2017). These findings indicate CBT-I can be an effective treatment for adolescents.

Low intensity interventions are needed as access to specialist mental health services for young people is limited (Stallard et al., 2007). Research indicates it may be more likely young people would seek help for sleep problems, compared to therapies targeting diagnoses such as depression and anxiety, as they are perceived as less stigmatizing (Blake et al., 2017). Thus, further research investigating the feasibility of delivering cost effective, low intensity sleep interventions is needed in community samples such as schools, where early intervention can occur.

There are key developmental differences between adolescents and adults, suggesting the need for an adolescent-specific sleep intervention (Clarke & Harvey, 2012). 'The Sleeping Better Programme' (Orchard et al., 2020) is a brief low intensity sleep intervention designed to treat insomnia in adolescents age 11-18 with common mental health difficulties. The intervention uses the key elements of CBT-I, focusing primarily on behavioural components, and has relevant adaptations for adolescents. The Sleeping Better Programme includes an initial planning session followed by four subsequent treatment sessions over a period of six weeks and the parent or carer is involved at each stage. The Sleeping Better Programme has previously been tested within a single-participant case study, who showed improvements in both sleep and mental health outcomes (Orchard et al., 2020). However, this was conducted in a clinical setting, with one young person, therefore generalising the results to a wider population is difficult. Additionally, sleep-related thought processes involved in insomnia were not measured pre-post intervention.

Aims

The planned aim for this project was to investigate the feasibility of recruiting and conducting a brief sleep-based intervention in a sample of adolescents attending schools or colleges in the East of England. A secondary aim was to increase the evidence base by using The Sleeping Better Programme with a larger number of participants. Our aims were guided by feasibility outcomes outlined by Bowen and colleagues (2009) and the CONSORT (Consolidated Standards of Reporting Trials; Eldridge et al., 2016) guidelines:

1. Acceptability: do young people like the sleeping better programme? What was the percentage of participants who stated that they were motivated to engage in sleep rescheduling as measured by the feedback form? What areas did participants find most and least helpful in the intervention? What was the percentage of attendance to the intervention sessions? What percentage of participants dropped out of the sleep intervention? On the feedback form did participants or their parents suggest any changes to the intervention?
2. Practicality: Were we able to recruit schools who were interested in taking part in the study? What were the barriers to recruitment of schools and participants?
3. Implementation: What proportion of young people stated that they were interested in being screened for Stage 2 (The Sleeping Better Programme) as measured by a question on the demographics form in Stage 1? What percentage of parents opted their children out of the study?
4. Demand: is there a need for sleep interventions for young people in schools? Do young people want help with their sleep? What percentage of participants were eligible and wanted to take part in the study? What percentage of participants were excluded from Stage 2?
5. Adherence: do young people complete each session?

6. Limited Efficacy Testing (exploration of session-by-session outcomes and pre- and post-effect sizes): are there changes in mental health and sleep-related thought processes pre- and post-intervention?

Methods

Design

The design was planned to be a pre-post feasibility study delivering the Sleeping Better Programme (Appendix M) within the community. Quantitative data was planned to be collected and compared within groups.

Participants

The inclusion criteria for Stage 2 were as follows: adolescents aged 11-18 attending a state school/college/sixth form; a score >5 on the Pittsburgh Sleep Quality Index (PSQI) as this has been cited as the threshold for insomnia (Buysse et al., 1989); a score >8 on the Insomnia Severity Index (ISI) as this indicates 'subthreshold insomnia', and still refers to disrupted sleep (Bastien et al., 2001); answered Yes to "Would you like some help with your sleep?" at Stage 1 (as identified from the demographics questionnaire). The exclusion criteria for Stage 2 were: currently undergoing any form of psychological therapy to improve sleep; currently taking prescribed or over the counter medication to improve sleep.

Measures

Details of the measures obtained during Stage 1 and planned for Stage 2 are presented below. The second author of the empirical research project (HC) focused on the mental health measures. Importantly to note, a measure of chronotype was planned to be administered at Stage 2 (The Sleeping Better Programme), given the circadian shift adolescents experience during puberty, and the preference for waking and going to bed later in this population (Carskadon, 2011; Roanneberg et al., 2004). 'The Reduced Morningness-Eveningness Questionnaire' (RMEQ; Danielsson et al., 2019) was planned to

be collected prior to Stage 2. This 5-item scale is a reduced version of the 'Morningness-Eveningness Questionnaire' (MEQ) which is the most widely used questionnaire measuring chronotype (Horne & Östberg, 1976). The RMEQ questionnaire has adequate validity in adolescents (Danielsson et al., 2019). The full MEQ has higher reliability and validity (Horne & Östberg, 1976), however we were mindful of the time burden of the questionnaires on adolescents. The RMEQ can be found in Appendix Q.

Demographic Information

- Participant's name, age, gender, ethnicity, school, and year group
- Participant's phone number and email address
- For Stage 2, participants planned to be asked to provide a parent or carer's name, contact details and address

Stage One

- Sleep: Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) and Insomnia Severity Index (ISI; Bastien et al., 2001)
- Thought-Processes: Glasgow Sleep Effort Scale (GSES; Broomfield & Espie, 2005), Dysfunctional Beliefs about Sleep Questionnaire for use with Children (DBAS-C10; Blunden et al., 2013) and Sleep Anticipatory Anxiety Questionnaire (SAAQ-Adolescent version; Bootzin et al., 1994)
- Mental Health: Short Warwick Edinburgh Mental Wellbeing Scale (SWEMWBS; Tennant et al., 2007) and Revised Child Anxiety and Depression Scale (RCADS; Chorpita et al., 2000)

Stage Two

- A sleep diary entry each day. The Consensus sleep diary was opted for as this has been found to be the 'gold standard' measure of subjective sleep (Carney et al., 2012)

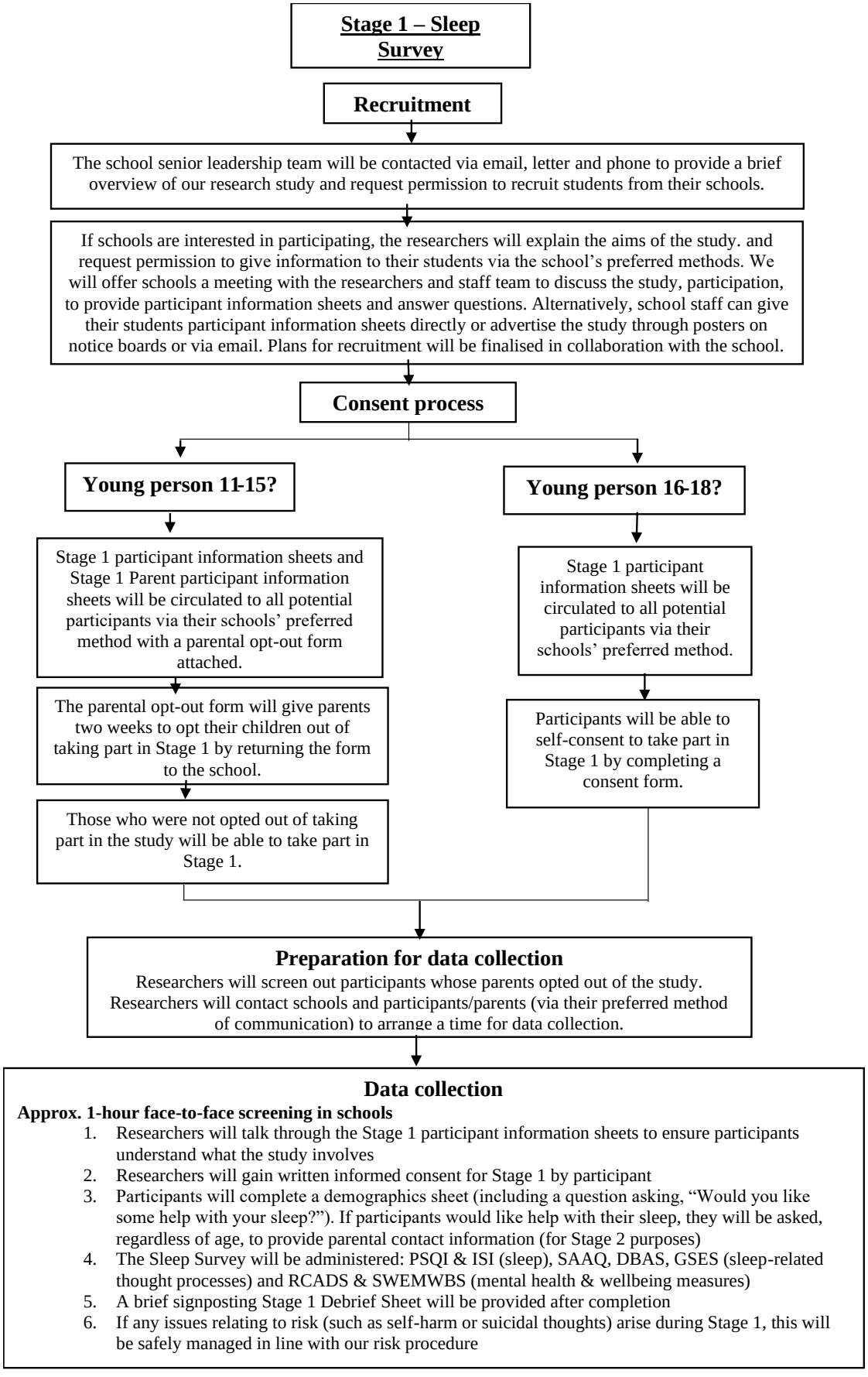
- The Reduced Morningness-Eveningness Questionnaire (Danielsson et al., 2019)
- Outcome Rating Scale (ORS; Duncan & Miller, 2000)
- Feedback form after the intervention
- Parent-rated RCADS (Ebesutani et al., 2011) and a parent feedback form

Initial Proposed Procedure

The diagram presented in Figure 1 outlines the full planned procedure for the two stages of the empirical research project. This accounts for the procedure for those under 16 given we had initially planned to recruit younger adolescents.

Figure 1

Full planned procedure flowchart for Stage 1 and 2



Stage 2 - Sleeping Better Programme

Screen for eligibility to Stage 2 based on inclusion/exclusion criteria.

- Invite eligible participants (those who meet screening criteria) and parents/carers to take part in Stage 2 via participants preferred method of contact (e.g., call, text, email, via schools/parents)
- Send Stage 2 Parent & Participant Information Sheets (via email, letter, schools to provide etc)
- Arrange baseline appointment (ideally with participant and parent, but if this is not feasible, arrange separate telephone contact with parent) and briefly discuss what study involves

Preparation for baseline session

A joint risk assessment will be carried out prior to this appointment by the researchers to ensure safe lone working conditions. If there are any concerns, on an individual basis an action plan will be developed in discussions with academic supervisors at the University of East Anglia to protect both the researchers and the participants.

Baseline session

1:1 face-to-face with adolescent and/or parent (1 hour) at school

1. Talk through Stage 2 information sheets with participant and parent
2. Gain written informed consent for Stage 2 for both participant and parent
3. Following a discussion, if participants screen positively for any sleep disorders other than insomnia they will be excluded from the study (e.g., sleep apnoea) and signposted to their GP for support if required. Additionally, participants will be excluded if they are currently receiving any other treatment for their sleep or mental health
4. A risk assessment will be conducted; if a participant is indicating risk such as suicidal ideation or self-harm that is not manageable within this low intensity intervention then they will be excluded from the study and signposted to their GP and more appropriate support such as Child and Adolescent Mental Health Services

Re-administer:

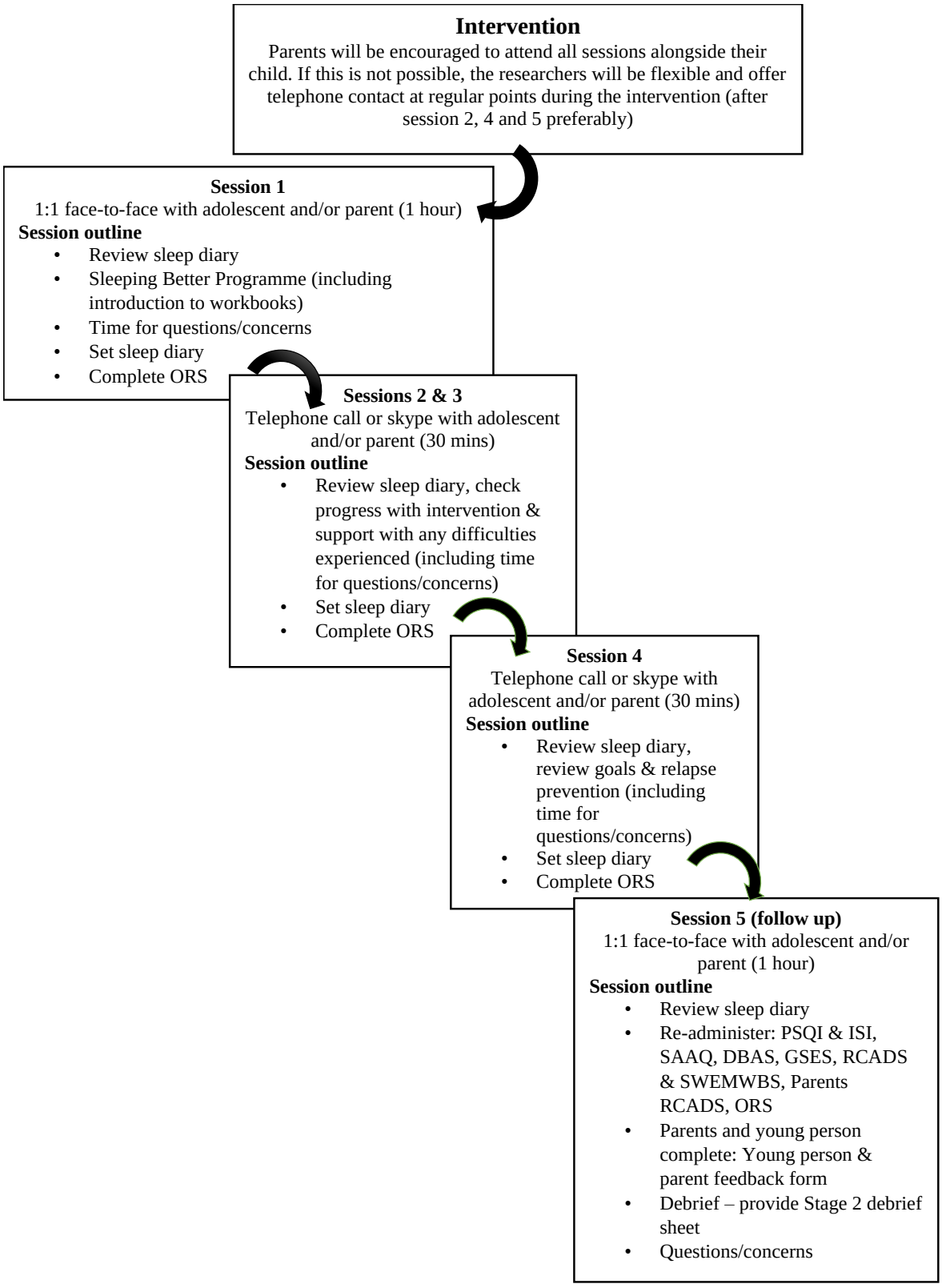
5. Sleep measures: sleep (PSQI & ISI), thought processes (SAAQ, DBAS, GSES) and mental health measures (RCADS & SWEMWBS)

Administer:

6. Parents RCADS, The Reduced Morningness-Eveningness Questionnaire (RMEQ)

Introduce:

7. Sleep diary and request 1-week baseline sleep diary (via participants preferred method of completion; e.g. app based, paper-based or online via email)
8. Ask if daily text reminders about sleep diary would be useful
9. Book in future appointments and allow time for questions/concerns



Note. Participant Information Sheets can be found in appendices F, H and I; Consent Forms can be found in appendices G and I; Debrief Sheets can be found in appendix L; Parental Opt-Out forms can be found in appendix H. PSQI = Pittsburgh Sleep Quality Index; ISI = Insomnia Severity Index; SAAQ = Sleep Anticipatory Anxiety Questionnaire;

DBAS = Dysfunctional Beliefs and Attitudes About Sleep Scale; GSES = Glasgow Sleep Effort Scale; RCADS = Revised Child Anxiety and Depression Scale; SWEMWBS = Short Warwick Edinburgh Mental Wellbeing Scale; ORS = Outcome Rating Scale; PIS = Participant Information Sheets. For those not eligible to participate after Stage 1, guidance on psychoeducation and self-help resources for adolescent mental health was provided as required to school pastoral teams. The risk procedure is discussed in the following section.

Additional Ethical Considerations

The purpose of this section is to outline additional ethical considerations for both Stage 1 and Stage 2 of the empirical research project. Detail is provided in terms of the 'opt-out' process and the full risk procedure.

Opt-out Process

For those under 16 years old, Stage 1 planned to involve an 'opt-out' process whereby parents were given two weeks to opt their child out of being involved in the study by ticking a box on the Parental Opt-Out form (Appendix H), signing, and returning it to the school (via email/post). This method of obtaining parental consent is often used when collecting survey data in schools and is more practical when recruiting a large sample size, where gaining consent from each individual parent would be difficult and time consuming. This was felt an appropriate methodology as participants were not from a clinical population and the research involved completing questionnaires which were not likely to cause distress. Additionally, the participants were of an age where they could understand the study information and assent could be reasonably assumed. It was planned for liaison to be had with schools regarding the best contact method to ensure that all parents received and read the relevant documents for the study and had the opportunity to opt their child out should they wish to in the easiest way possible.

If for any reason the parent did not receive or read the opt-out information and their child completed the questionnaires, parents were planned to be welcomed to contact AS

and HC to withdraw their child's data from the study. They were also planned to be welcomed to contact the researchers directly should they wish to complain, and if they wished to pursue a formal complaint, we planned to direct them to the head of department. The process for this was clearly outlined on the information sheet. Given no participants were under 16 years old, this process did not occur.

Risk Issues and Risk Procedure

It was not expected that this research would lead to risk of harm or distress, as the study was designed to provide a psychological intervention to improve sleep, and thus reduce distress. It was possible that participants may have found it difficult completing questionnaires and talking about their sleep and feelings, but this was planned to be managed by the researchers and their supervisors (Clinical Psychologists) who are trained in dealing with such situations. Prior to the study, participant information sheets and consent forms (for Stage 1 and 2) made it clear that any concerns that are identified which may put them at risk to themselves or others, would be followed up with a named person at their school and/or their parent, as a duty of care.

It was possible that during the study, the researchers could become aware of risks to participants (such as self-harm, suicidal ideation, and other safeguarding concerns). If these risks were identified, clear procedures had been considered to manage this.

At Stage 1:

- If participants scored above a certain level on the mental health and sleep measures (e.g., scoring above the clinical threshold on an RCADS subscale) or highlighted any risk issues (e.g., suicidal ideation or self-harm), the school's named pastoral care staff (or similar) was notified so that they could offer or signpost students to appropriate support. This was done in line with the schools specific safeguarding and risk policies.

- For all participants, regardless of age, their parent/carer was notified via the contact details collected in the demographic information sheet, or if this was not provided, teachers were asked to inform the parents.

At Stage 2:

- Prior to the intervention, and once consent was obtained, it was planned for a letter to be sent to schools notifying them of the participant's involvement in the study and explaining that a named person at the school would be notified if any risk issues arose.
- A risk assessment would have been conducted to assess for suicidal ideation, suicidal behaviours, and self-harm at the start of the intervention and at each session.
- A safety plan would have been drawn up in all cases if the young person expressed any level of self-harm or suicidal ideation. The safety plan was due to include anonymous helplines such as the Samaritans, and named adult contacts in the young person's life, as well as practical strategies. This was planned to be shared with the parent/carer.
- If a participant presented with significant suicidal ideation, plans or intent to act upon the thoughts, or moderate to severe self-harm behaviours, they would have been excluded from the study and the intervention will cease. Those participants and their parents would be signposted to their GP to receive more appropriate support (such as Child & Adolescent Mental Health Service input). This was planned to be a low intensity intervention with minimal input, therefore significant risk issues were thought to be best managed with a more intensive intervention.
- If the participant expressed that they were an immediate risk to themselves we planned to speak with the parents immediately and, if appropriate, encourage them to go to the closest Accident and Emergency service where they could be assessed

by someone from the mental health team. If this was not possible, the police would have been called to conduct a welfare check.

- All risk issues would have been discussed promptly in supervision with qualified clinical psychologists from the university. It was planned for there to be access to a qualified psychologist whenever contact was had with a participant, and they would be contactable for any urgent risk discussions.
- Appointments would have been offered in the participant's school (school permitting) or at the University of East Anglia (UEA). As some appointments could have been after school/university finish times this could have involved some lone working and therefore, additional procedures would be followed to protect the safety of the participants, and the researchers.
- Lone working policies outlined by the Trust and UEA would have been adhered to and Buddy System Guidelines to be followed. At all times, a staff member or colleague (as well as research supervisors) would have been aware of the timings and location of visits, and the researchers would always have access to a mobile phone with a point of contact available to them. Researchers would have passed details of the visit to their buddy on the day of the appointment.

Risk issues and the risk procedure were discussed with the schools who took part. Input was gained from a school nurse for their considerations regarding risk. The school nurse advised the importance of being clear about confidentiality with the young person and parent (e.g., needing to share information with parent/school if risk issues arise) and they were pleased this was made explicit in our proposed information sheets.

Planned Analyses

This section outlines the planned analyses (pre-post change) of the measures planned to be collected for Stage 2. It was anticipated the results of any pre-post change for the intervention should be interpreted with caution if there was a small sample size.

Session by Session Outcomes

The ORS scores would have been visually inspected for changes between each session. Effect sizes planned to be calculated to assess for improvement over the course of the intervention.

Sleep Outcomes

Effect sizes change from pre to post intervention on the:

- PSQI: total scores
- ISI: total scores
- Sleep diary: sleep efficiency, sleep onset latency and total time asleep

Mental Health Outcomes

Effect size change from pre to post intervention on the (for author HC's project only):

- Total SWEMWBS scores
- RCADS and RCADS-P total anxiety score
- RCADS and RCADS-P anxiety subscales
- RCADS and RCADS-P depression subscales

Sleep-Related Thought Processes Outcomes

Effect size change from pre to post intervention on the:

- GSES total score
- DBAS-C10 total score
- SAAQ-A total score and three subscales (somatic, sleep cognitions and planning and rehearsal)

Screening Survey Data

The point prevalence of insomnia in the sample was planned to be calculated as measured by scoring above five on the PSQI (threshold for poor sleep quality; Buysse et al., 1989) and above eight on the ISI (subthreshold for insomnia; Bastien et al., 2001).

Sample Size Considerations and Recruitment Challenges

This section outlines the full sample size considerations, power calculation and recruitment challenges for the empirical research project.

Initially, the empirical research project was planned as a feasibility study, therefore considerations for sample size were originally based on this. Research indicates there is no agreed consensus on a suitable sample size to use in feasibility studies, but it is important that the sample is *"large enough to provide useful information about the aspects that are being assessed for feasibility"* (Thabane et al., 2010). Research has suggested for pilot and feasibility studies, a sample of 30 is appropriate (Browne, 1995; Lancaster et al., 2004; Hertzog, 2008). Therefore, a sample of 30 was aimed for, which would mean the main author AS and second author on the empirical project (HC) would divide participants to conduct the Sleeping Better programme (i.e., 15 participants each). The initial screening/recruitment phase (Stage 1) was utilised to ensure there were enough participants who would be eligible to take part in the intervention. The prevalence rate of insomnia in adolescents was considered given the initial inclusion criteria was to include participants with symptoms of insomnia and poor sleep quality. Point prevalence rates of insomnia symptoms in adolescents vary in epidemiological research, ranging from 13.6%-40% (Hysing et al., 2013; Chung et al., 2012). Therefore, to ensure there were enough participants with insomnia symptoms for Stage 2 (n = 30), recruitment was planned to be conducted with up to five schools/colleges aiming for between 200-300 participants. However, the exact number for screening at Stage 1 planned to be dependent on prevalence, uptake, and resource.

Unfortunately, there were several issues with recruitment meaning the empirical project did not achieve the sample size aimed for. Recruitment for Stage 1 was planned to finish early (ideally April-May 2020), given the second part of the study. Initially, a school nurse was the gatekeeper for the project, and they had planned to link the study in with

schools in the East of England (December 2019 – March 2020). However, there was an unforeseen event which meant the school nurse was no longer able to support the study (March 2020).

A decision was then made to contact schools (n = 5) directly in the local area. Three of these schools responded. One of these fell through, meaning there were two schools to recruit from. Given a strong link was made with a teacher at one of these schools, and given they had many students (n = 1955 in 2018/9 academic year), a decision was made to widen recruitment throughout this school. The teacher involved sent emails to the entire staff team updating of the study and asking for further recruitment possibilities (February 2020). However, only one other teacher responded. This meant data was collected (face-to-face) across two schools, during three visits (January – March 2020).

On the 23rd March 2020 a national lockdown was declared as a result of the COVID-19 pandemic. Ethical approval was initially only gained for face-to-face recruitment, therefore the study needed to gain approval to recruit online. This meant an online survey for the study was created, the ethics application was amended and awaited confirmation (May 2020; Appendix O). At this point, we were still considering completing the second stage of the study. After ethics approval was granted to move the study to online recruitment, a decision was made to use the links already developed with the two schools. Permission was requested from these two schools to circulate the study online via the weekly school bulletin (May 2020). Only one school agreed to this. Teachers took longer to reply during the onset of the pandemic, possibly due to the unprecedented changes and challenges. When they did make contact, they informed they anticipated the uptake would be low given the impact of the pandemic, and school holidays were approaching.

Given these challenges, a decision was made for the projects aims, and scope to change from a feasibility study to a study exploring relationships between sleep variables

based on the data already collected at Stage 1 and planned to continue to collect via online surveys (July 2020). An a priori sample size calculation using G*Power (Version 3.1) was then computed. This indicated a sample size of 82 to detect a medium effect (r = .3) with 80% power for a two-tailed correlation. Unfortunately, only three participants completed the survey online during May-September 2020. A decision was made to conclude recruitment in September 2020, given time constraints on the doctorate course. Therefore, the sample size was not achieved.

Chapter 7. Additional Chapter: Preliminary Feasibility Results

The purpose of this chapter is to present preliminary feasibility results from the empirical paper and a brief discussion on the findings.

Feasibility Data

Practicality

Initial recruitment planning involved identifying local professionals to connect with who were involved or worked with schools locally. A school nurse who worked across five areas in the East of England acted as the gatekeeper for the ethics approval. Unfortunately, recruitment was not successful from any of these areas despite attempts made on several occasions. This was primarily due to the following reasons: 1) when recruitment commenced in December 2020, students were due to have their Christmas break 2) in January 2020, students had upcoming exams 3) in March 2020 the COVID-19 pandemic meant there were closures of schools. Additionally, one school the school nurse had identified was a private school, which did not meet our inclusion criteria.

At this point, a decision was made to contact five schools and colleges directly. If there was a research department within the team, this contact was used alongside the generic school email address provided on school websites. Of these schools contacted, three responded to enquiries. The first (School 1) was a large sixth form college in a large town location, which catered for students who were completing their A-Levels and other courses. The second (School 2) was a small college in a rural area which catered for students who were often resitting their GCSE's and the college courses offered were practical in nature (such as beauty, computer gaming, woodwork). The third (School 3) was a large college in a large town centre location which catered for similar students as just listed.

Of these three schools, there was successful recruitment from Schools 1 and 2. The teacher who responded to enquiries from School 1 had a particular interest in sleep, lifestyle, and mental health research. Most participants were recruited from this school. Two phone conversations were arranged initially with the teacher from School 1 to discuss the process of recruitment. The preferred method for this school was to administer the questionnaires during a lesson. Fortunately, the topic of 'Sleep' was on the current curriculum for this schools' lessons. All students from this school were studying a sports related qualification. School 2 made contact only via email to discuss the process of recruitment. The preferred method for this school was to administer the questionnaires during a lesson also. Students at this school required slightly more support with completion of the questionnaires in terms of understanding the questions and took longer to complete. Several students at this school had some additional needs including learning difficulties. School 3 made initial contact via telephone and email, but unfortunately due to timings and the impact of COVID-19, it was not possible to recruit from here.

When the project was distributed online (during May – September 2020) as a result of the COVID-19 pandemic, only three participants completed questionnaires.

Demand

There were 66 participants who consented to and completed the questionnaires. However, one participant was excluded from the main analysis due to being outside of the age range (under 16). This was not in line with our ethics approval; however, it was an unforeseen circumstance (they were present within a teaching session where researchers were informed all students were Year 13) and was addressed as soon as this was realised during scoring of the surveys. As per the risk protocol, the teacher at this young person's school was informed and parents contacted accordingly. As identified from the demographic's questionnaire, 33 participants (51%) reported they would be interested in taking part in the sleep intervention (Stage 2).

Implementation

The initial inclusion criteria for taking part in the Stage 2 intervention was young people who obtained a PSQI total score of more than five and an ISI total score of eight or more, and who had self-reported wanting help for their sleep. Based on these criteria, 13 (20%) were eligible for Stage 2. In March 2020, eight of these eligible participants were approached via email offering to engage in Stage 2. The additional five participants had either not provided contact details or the contact details provided were not accessible. Therefore, teachers were informed of these five participants to check if they did want to take part, and to request contact details if so. None of these participants responded to the email invitation. The researchers had plans to follow up via telephone, however the COVID-19 March lockdown occurred meaning schools closed. Therefore, it was no longer feasible to offer the intervention as ethics approval had only been granted to conduct this face-to-face and there were several challenges identified with attempting to move to online delivery. This included concerns that usual routines, including sleep would be disrupted during this time and therefore our results may not be representative of adolescents' usual sleep disturbance. Undoubtably, teachers and students were facing unprecedented stress in relation to adaptions needed for home schooling. Schools were contacted to inform of the pause in our study whilst ethical amendments were sought, and to update their students, and we ensured to keep updated on any changes.

Discussion

Of the five schools who were contacted, three were interested in taking part in our study, and 51% of the participants who completed the questionnaires were interested in taking part in the intervention. Similarly, teachers who were contacted all expressed enthusiasm for the need for this type of support for their students in schools. This provides evidence to suggest there was some demand by teachers and students for students to receive a sleep intervention in schools.

Practically, schools responded best to proactive engagement using telephone and email methods, and face-to-face contact. They also preferred (where possible) for the recruitment phase to be completed during a timetabled lesson face-to-face, as they felt this would improve concentration and motivation by the students, and it supported their current teaching curriculum. Liaison with schools was important to decide the appropriate method of recruitment based on the needs of their individual school.

After liaison with schools about the impact of COVID-19, only one school were agreeable to Stage 1 being completed online. The survey was distributed online at this school via a generic communications email in May 2020. At our planned recruitment end date in September 2020, there were only three responses returned. This could possibly be attributed to the COVID-19 pandemic, the method of distribution via online survey (e.g., not having the same motivation and support from the teachers as when the survey was completed face-to-face in lessons), and given it was mainly school holidays during this time. It was also not clear how many students read the generic communications email.

Positively, 51% of participants stated they would be interested in taking part in the Sleeping Better Programme. Our original inclusion criteria were to offer a sleep intervention to young people who wanted help for their sleep and had subthreshold insomnia symptoms and poor sleep quality (n = 13). However, given half of the sample expressed interest, adolescents may wish to engage with a brief sleep intervention, regardless of their current insomnia symptoms. This has clinical relevance as through offering interventions in schools, it could be possible offer support to those who are not reaching the thresholds of CAMHS (Children and Adolescent Mental Health Services), whilst supporting our local CAMHS who are currently over-stretched. Additionally, this interest supports the suggestion that young people may rather seek help for sleep problems, compared to therapies targeting diagnoses such as depression and anxiety, as they are perceived as less stigmatizing (Blake et al., 2017).

As it was not feasible to conduct Stage 2 of the study in the time permitted, an unanswered question relating to the feasibility of adherence, implementation and acceptability of a brief sleep intervention delivered in schools remains. Given the impact of the COVID-19 pandemic, future research into brief sleep interventions in schools could explore the efficacy of conducting these remotely.

Finally, given the schools involved were committed, passionate and supported our research, the researchers developed a 40-minute webinar which focused on simple psychoeducation and tips to improve sleep based on psychological theory and strategies from CBT-I. This was distributed to the schools who took part in our research. However, the delivery of the webinar was pre-recorded and then distributed, which meant it was not possible for participants to have active engagement with the presentation as questions and answers could not be facilitated. Secondly, there is a lack of knowledge of how widely the presentation was disseminated, and no formal feedback was obtained for the webinar, therefore it remains unclear if the presentation was beneficial. Additionally, the researchers conducting the webinar needed to adapt and learn how to deliver therapeutic strategies remotely. Despite these challenges, the webinar could be an approach adopted in the current context of the COVID-19 pandemic whereby standardised information can be shared widely.

Conclusions

Our preliminary feasibility findings provide some evidence to suggest (a) students may be interested in participating in sleep interventions delivered in schools (b) there can be some barriers (school terms time, recruiting online) and facilitators (proactive engagement with teachers, recruiting during stages of relevant curriculum) of recruiting participants from schools. There remains a key unanswered question surrounding the feasibility of implementing sleep interventions in schools. Future research would also

benefit from exploring the feasibility and efficacy of delivering remote sleep interventions in community settings.

Chapter 8. Discussion and Critical Appraisal

Overview of Chapter

This final chapter summarises and integrates the main findings from the meta-analysis and empirical research project. A critical evaluation with strengths and limitations is presented, including clinical implications and suggestions for future research. Overall reflections are discussed, and a summarising conclusion of the entire thesis portfolio is reported.

Main Findings

Meta-analysis

The meta-analysis presented within this thesis portfolio firstly aimed to investigate whether non-pharmacological sleep interventions change anxiety symptoms immediately post-intervention. Secondly, the review aimed to investigate whether non-pharmacological sleep interventions change sleep-related thought processes immediately post-intervention. The following research questions aimed to be addressed:

1. Do non-pharmacological sleep interventions aimed at improving sleep change anxiety symptoms?
    c. Do non-pharmacological sleep interventions aimed at improving sleep change anxiety symptoms for individuals with additional physical health difficulties?
    d. Do non-pharmacological sleep interventions aimed at improving sleep change anxiety symptoms for individuals with additional mental health difficulties?
2. Do non-pharmacological sleep interventions aimed at improving sleep change sleep-related thought processes?

The overall meta-analysis (RQ1) aimed to identify all Randomised Control Trials (RCTs) of non-pharmacological sleep interventions which reported anxiety symptoms as a primary or secondary outcome measure collected at immediate post-intervention. Effect

sizes were pooled into a random-effects meta-analysis model which statistically synthesised results of all included studies. Two subgroup analyses were conducted to investigate (a) whether there was an elevated effect size in participants with additional mental health difficulties, (b) whether there was an elevated effect size in participants from a physical health population. A secondary meta-analysis (RQ2) was conducted on studies which had reported a sleep-related thought process measure. An overall quality checklist was conducted to assess the methodological quality of the studies.

The overall meta-analysis (RQ1) found a small to moderate effect indicating non-pharmacological sleep interventions reduce anxiety symptoms at immediate post-intervention. Subgroup analyses found a moderate effect of non-pharmacological sleep interventions reducing anxiety symptoms in participants with physical health difficulties and in participants with mental health difficulties. These findings suggest non-pharmacological sleep interventions may have slightly more benefits on anxiety symptoms for those with mental or physical health difficulties. However, there were less studies within these analyses, which could have contributed to the larger effect size. This should be considered when interpreting these results.

Ten studies included a sleep-related thought process measure, eight of which used the Dysfunctional Beliefs and Attitudes About Sleep scale. A secondary meta-analysis found a large effect of non-pharmacological sleep interventions reducing maladaptive sleep-related thoughts immediately post-intervention.

Strengths. The meta-analysis presented within this thesis portfolio is the first to explore the effect of non-pharmacological sleep interventions on anxiety symptoms, and sleep-related thought processes, therefore providing a unique contribution to the literature. A meta-analytic approach has advantages in that it is superior to narrative reports for systematic reviews and can statistically combine vast amounts of studies or trials (Fagard et al., 1996). The effect size found in the overall meta-analysis (RQ1) was similar to effect

sizes found in meta-analyses exploring the effect of CBT for anxiety on anxiety and anxiety-related disorders (Carpenter et al., 2018). Findings from Carpenter et al. (2018) demonstrated moderate placebo-controlled effects of CBT on target disorder symptoms , and small to moderate effects on other anxiety symptoms. This has clinical significance in that despite non-pharmacological sleep interventions not directly targeting anxiety, they can lead to improved anxiety symptoms, and this is comparable to therapy which directly targets anxiety. This could suggest non-pharmacological sleep interventions may be offered to individuals struggling with anxiety symptoms.

The large effect size found on the secondary meta-analysis investigating effects on sleep-related thought processes (RQ2) adds to previous findings. For instance, another meta-analysis which specifically focused on CBT-I for dysfunctional beliefs and attitudes about sleep also found a large effect size (Thakral et al., 2020). Our findings provide further evidence to suggest other non-pharmacological sleep interventions may be effective at reducing unhelpful thoughts involved in the maintenance of insomnia. Our findings provide clear indications for future research through investigating the mechanisms by which treatment for sleep can improve anxiety: through reducing unhelpful sleep-related thoughts, does this in turn reduce anxiety? This could be explored through use of a mediational model investigating whether sleep-related thought processes mediate the relationship between anxiety and insomnia.

The meta-analysis focused on RCTs only, which are considered the ‘gold standard’ for effectiveness research (Hariton & Locascio, 2018). The large effect size found in the subgroup analysis on pre-sleep thoughts provides support for cognitive models of insomnia, and cognitive therapy for insomnia. The moderate effect size found in the subgroup analysis on physical health participants provides a novel contribution to the literature. This could have clinical implications for physical health settings, as well as

indicating the need for future sleep and anxiety intervention research to consider this population.

The meta-analysis performed a robust and rigorous search of five different electronic databases. Additionally, a protocol was published in advance on PROSPERO and the meta-analysis was conducted in line with this. The findings extend upon a previous meta-analysis which explored the effect of CBT-I on anxiety symptoms (Belleville et al., 2011), by including other treatments for sleep, limiting studies to RCTs, and ensuring studies which incorporated interventions that targeted anxiety were excluded. Therefore, our study provides a valuable contribution of the highest quality research available. Additionally, given our review ensured the studies included specifically focused on sleep-targeted interventions with no anxiety intervention, this provides more confidence in the findings of the indirect effects of sleep interventions on anxiety symptoms.

Finally, the meta-analysis conducted two sensitivity analyses, firstly with low quality studies removed, and secondly with two outliers removed. Bown and Sutton (2010) highlight *"a sensitivity analysis is an important part of a meta-analysis as it aims to determine the robustness of the observed outcomes to the assumptions made in performing the analysis".* Yet often in meta-analyses, these are not performed (Bown & Sutton, 2010). Given the overall effect size (g) only marginally changed (from g = -0.38 to g = -0.37; -0.36 respectively), this suggests the results of our review can be interpreted with confidence.

Limitations. There were moderate rates of heterogeneity across the overall meta-analysis. This may be attributed to a combination of clinical (differences in participants, interventions, or outcomes), methodological (differences in study design and bias), and statistical differences (including variation in intervention effects or results). The two subgroup analyses conducted aimed to explore possible sources of heterogeneity, particularly in relation to possible participant differences. When these subgroups were

conducted (physical health and mental health participants), the heterogeneity significantly reduced. This could suggest participant differences may partly explain the heterogeneity found in the overall meta-analysis. However, there were small numbers included within the two subgroups, meaning these results should be interpreted with caution. Additionally, research indicates adults who work shift patterns require frequent adjustments to their natural circadian rhythm which can lead to excessive fatigue, insomnia, and depression (Richter et al., 2016). Notably, studies included in the meta-analysis did not always report the participants occupation, or if the participant worked shift patterns, therefore this was not considered. However, this could have also been a possible factor accounting for heterogeneity.

Despite the measures of anxiety included in the meta-analysis having good psychometric properties, there was variability in the questionnaires. This included differences in length (from 2 items in the GAD-2 to 7 items in the HADS-A) and differences regarding the concept of anxiety measured (e.g., state versus trait anxiety). Moreover, the meta-analysis employed a random-effects model (rather than a fixed-effect model) as this assumes the effects being estimated in the different studies are not identical but follow some distribution, therefore assuming some level of heterogeneity between the individual studies (Bown & Sutton, 2010). Additionally, it must be noted that is common for high levels of heterogeneity to be found in meta-analyses, particularly psychological intervention studies (Kriston, 2013) where it is often difficult to control for individual differences, blind participants to interventions, and due to differing intervention trial designs.

Importantly to note, the quality checklist used in this review was challenging to implement, which has been found in recent research (Minozzi et al., 2020). Further the tool does not allow for multiple outcomes to be assessed for quality, therefore additional measures (such as sleep) were not assessed. Further, the tool is highly conservative where

if one domain obtained a ‘some concern’ score in one area, this impacted the total ‘overall bias’ for that study. All efforts were made to find registered trial protocols for each individual study for quality assessment purposes, given these outline key information required for quality assessment such as statistical analyses plans. However, for some studies these were not readily available.

Whilst the meta-analysis involved a thorough search of RCTs using five databases and screening references, no grey literature was sought, therefore some unpublished data may not have been included. This was primarily due to the time constraints involved on the doctoral course. Additionally, the hierarchy used to choose the included intervention arm within the meta-analysis may have led to some data not being captured (e.g., not capturing ‘less evidence-based’ CBT-I components such as Cognitive Therapy). Rather than using a hierarchy, a pooled effect size could have been computed statistically to provide an overall effect of combined sleep interventions.

Finally, additional subgroup analyses were planned to be conducted if there were sufficient studies. However, given most studies included in the meta-analysis were psychological interventions, it was not appropriate to conduct a subgroup analysis exploring the type of sleep intervention (e.g., psychological versus other sleep intervention). Studies included did not always report the profession of the facilitator, therefore a subgroup analysis was not conducted exploring the impact of type of profession (e.g., qualified therapist, student, trainee etc.). Furthermore, given there were only two studies which focused on children and adolescents in the overall meta-analysis, a subgroup analysis was not conducted on this population. Similarly, no studies within the secondary meta-analysis exploring the effects of sleep interventions on sleep-related thought processes included child or adolescent participants. These findings therefore indicated further exploration of sleep-related thought processes was needed in the child and adolescent population.

Empirical Research Project

Findings from the meta-analysis found non-pharmacological sleep interventions significantly reduce unhelpful sleep-related thought processes involved in the maintenance of insomnia in adults. However, less was known about the presence and associations of these thought processes in adolescents. Therefore, unanswered questions remained including (1) are sleep-related thought processes which map onto cognitive models of insomnia in adults, related to poor sleep quality and insomnia severity in adolescents? The empirical research project which followed aimed to contribute to this gap in the literature.

Sixty-five adolescents completed a sleep survey consisting of a demographics questionnaire, the Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), Glasgow Sleep Effort Scale (GSES), the Dysfunctional Beliefs and Attitudes about Sleep (DBAS-C10) and the Sleep Anticipatory Anxiety Questionnaire (SAAQ-A). Correlational analyses found subjective insomnia severity and sleep quality are associated with different sleep-related processes involved in the maintenance and development of insomnia, as has been found in the adult literature. More specifically, sleep effort and sleep anticipatory anxiety were associated most strongly with subjective insomnia severity, rather than subjective sleep quality.

What is more, the meta-analysis presented in this portfolio found there was a significant lack of RCTs exploring non-pharmacological sleep interventions in adolescents. Therefore, unanswered questions remained including (1) do non-pharmacological interventions aimed at improving sleep change sleep-related thought processes in adolescents? Stage 2 of the empirical research project planned to contribute to this gap in the literature by identifying any pre-post changes in sleep-related thought processes after a brief psychological sleep intervention. This remains an unanswered research question as Stage 2 was not conducted, given the impact of the COVID-19 pandemic pertaining to the challenges of moving the study completely digitally and recruitment constraints. However,

the large effect size found in the meta-analysis in the subgroup analysis on sleep-related thought processes, combined with the associations found between insomnia severity and sleep-related thought processes in the empirical research project, has potential clinical implications. Adults and adolescents presenting with sleep difficulties or anxiety could be screened for co-related sleep thought processes, which may provide a less stigmatising initial clinical screening approach.

Overall, findings from the empirical project suggest there may be similar processes involved in adolescents with sleep difficulties, as adults. However, there may be interacting biological, environmental, and social differences in adolescents which may be important to consider further. In early adolescence, bedtimes and wake times may be managed and in line with routines set by parents or carers. In later adolescence, young people may have more autonomy and responsibility over their sleep and other routines. This transition may be difficult for young people to adjust to. This could suggest the importance of considering the family system when supporting adolescents with sleep difficulties, which may be different for adults who are not so confined by others' routines. This had been considered in the empirical project, where it was planned for the system around the young person to be part of the intervention. Additionally, given some of the intervention may have involved sleep restriction, it was felt important for parents to be aware of the psychological rationale for this, given this may mean adolescents would retire to bed later than usual.

What is more, adolescents are restricted by early school start times. A term coined 'Social Jetlag' explains the misalignment between biological preferences and social schedules such as school (Wittman et al., 2009). As adolescents' transition through puberty, they experience a shift in their circadian rhythm, therefore having a natural tendency for waking and going to bed later. Chronotypes refer to individual differences in the timing of circadian rhythms, with some people preferring to fall asleep and wake early

("morning larks"), and others preferring a later schedule ("night owls"; Wyatt & Cvengros, 2012). This is important to consider, given age is a factor in determining individuals chronotype preference, with research finding teenagers prefer a later schedule (Roenneberg et al., 2004). Individuals with a late chronotype find it more difficult to adjust to social schedules, like early school start times. This is difficult given adolescents usually wake early during the week for school, but then often retire to bed late and wake late at the weekend to 'catch up'. When adjusting back to an early school start time after the weekend, this can leave adolescents feeling 'groggy', like that of jetlag.

Research continually has found the cost of this misalignment (late chronotype preference and early school start times) for adolescents is poorer school performance (Zerbini et al., 2017), poorer dietary behaviours (Arora & Taheri, 2015) and poorer mental health (Gulec et al., 2013). Adolescents chronotype preference should therefore be considered for any sleep intervention, particularly when considering elements of Cognitive Behavioural Therapy for Insomnia (CBT-I) such as sleep rescheduling which can temporarily increase daytime fatigue. The impact of chronotype was considered within the empirical research project, and ethical approval was gained to use a short, validated questionnaire, had the second stage of the study been completed. It may be important for any future sleep intervention research focused on adolescents and adults to measure chronotype, given there may be adjustments or considerations needed. Future sleep intervention research may also benefit from incorporating the family system, given individual differences within the system in terms of social schedules and chronotypes.

Strengths. Research continues to be sparse in terms of investigating the underlying mechanisms involved in adolescent insomnia. This study provides a novel contribution to the literature by providing some evidence to suggest there are similar maintenance factors involved in adolescent insomnia as in models of insomnia in the adult literature. These

correlational findings provide a good starting position for future, larger research such as further investigations into understanding the interactions between the mechanisms.

Schools that participated in the study were positive and felt sleep was an important, appropriate topic. The Wellbeing webinar which was distributed was highly appreciated. The project received Patient and Public Involvement prior to recruitment, and the information sheets gained positive feedback from adolescents, and they felt they were appropriate for their age range. Despite the sleep survey containing several measures, no participants gave feedback that this felt burdensome. Teachers also reflected on finding the survey prompted useful conversations about sleep within their classes. Positively, half of participants who completed the survey expressed they would be interested in receiving some support for their sleep, which provides some evidence to suggest students may be interested in taking part in a sleep intervention in schools. This interest could support the suggestion that young people may rather seek help for sleep problems, compared to therapies targeting diagnoses such as depression and anxiety, as they are perceived as less stigmatising (Blake et al., 2017). Despite Stage 2 of our project not being conducted, we meaningfully considered the measures we planned to use, the materials prepared for potential participants and time spent learning how to deliver the Sleeping Better Programme. Finally, we thoughtfully considered ethical issues, including possible risk issues, and ensured we had robust processes in place to manage a range of possible situations.

Limitations. The recruitment procedure involved initially using the gatekeeper school nurse who intended to link us in with the schools they covered and then contacting schools directly via email or telephone. However, in hindsight local authorities who oversee public schools could have been contacted, which may have led to a higher response rate of schools.

On March 23rd, 2020, schools and colleges in the UK were closed due to government restrictions as the COVID-19 pandemic deteriorated. Given several significant impacts related to COVID-19 (including requesting amendments to ethics, additional time needed to transfer survey questions online, less communication responses from teachers due to impact of the pandemic, delays in schools distributing questionnaires and less survey responses completed online), the sample that was aimed for in Stage 1 was not achieved. The total sample size of the project was relatively small, therefore results should be interpreted with this considered. There was low completion of surveys online, which could have been attributed to the COVID-19 pandemic, the school holidays approaching, or students not reading the news bulletin that the survey was distributed via (it was not clear how many students had seen the questionnaire).

Despite no students reporting the sleep survey was time burdensome, it must be noted there were several questionnaires to be completed. Additionally, completion time varied between students, which could have been due to differing reading abilities or additional learning needs. Therefore, these individual differences could have been taken into further consideration, and adaptions to the survey made, as necessary. Although a sleep webinar was circulated to the schools who participated in our study, no formal feedback using self-report questionnaires was obtained, therefore it remains unclear if this was beneficial for students. Despite these limitations, the preliminary evidence provides further information into possible maintenance factors involved in adolescents with poor sleep.

Additional Findings

Additional findings from the empirical research project found other positive correlations between subjective sleep and sleep-related thought processes which may be important to consider. A large correlation was found between subjective sleep latency (subscale on the PSQI) and insomnia severity. Similarly, a large correlation was found between subjective sleep latency and sleep effort. These findings may support previous

research which has found wakefulness in bed can lead to the development of other mental health problems, and internalising and externalising behaviours (Lovato & Gradisar, 2014; McMakin & Alfano, 2015). This may suggest adolescents could benefit from support in managing unhelpful thoughts during the wakefulness period when trying to get to sleep. This may be achieved through behavioural and cognitive components in CBT-I, for example, increasing the bed-sleep association by restricting time spent in bed awake worrying or ruminating.

Despite Stage 2 of the study not being conducted, there was some useful feasibility data reported. Of the adolescent sample, 51% (n = 33) reported they would be interested in a sleep intervention. Additionally, based on our original inclusion criteria (young person indicating they would like help for their sleep, and meeting threshold for PSQI, and subthreshold for ISI), 20% (n = 13) of the sample would have been eligible to take part in Stage 2. This suggests adolescents may wish to engage in a sleep intervention offered in schools. However, as discussed, it was not feasible to conduct Stage 2 of our study in the time permitted. Therefore, an unanswered question relating to the feasibility of implementation and acceptability of a brief sleep intervention delivered in schools remains.

Clinical Implications

Findings from both projects discussed in this thesis portfolio have possible clinical implications regarding service delivery and development. In psychological services such as IAPT (Improving Access to Psychological Therapies), anxiety and depression are screened and treated. However, despite insomnia being a recognised symptom of depression, and having a bidirectional link with anxiety, it is not currently recognised as a ‘condition managed by IAPT’ in NICE guidance (National Institute of Clinical Excellence, 2011). Given the meta-analysis presented in this portfolio provides evidence to suggest through treating sleep problems, this could in turn improve anxiety symptoms, this shows the potential for screening and treating insomnia/sleep problems in such services. Further, this

could support guidance of the right intervention for people presenting with common mental health problems by including CBT-I which can be offered effectively in brief modalities (Orchard et al., 2020).

Results from this meta-analysis suggest non-pharmacological sleep interventions can reduce unhelpful sleep related thought processes. Results from the empirical research project suggest sleep-related thought processes are associated with poorer sleep quality and increased insomnia severity in adolescents. These findings have implications for psychological and specialist sleep services including the possible need to screen for these thought processes in adults and adolescents. This could provide insight into possible maintenance factors underlying insomnia, which may be then targeted in therapy.

National transformation plans have outlined different initiatives to support Children and Young People's mental health in the UK (The National Health Service Long-term Plan, 2019). This includes increasing the provision of mental health support in schools. The NHS has funded new Mental Health Support Teams working in schools and colleges, building on the support already available, which is being rolled out to between one-fifth and a quarter of the country by the end of 2023. The aims are to provide preventative and early intervention support, including better information sharing and the use of digital interventions, and to help moderate the need for specialist child and adolescent mental health services. The findings from the empirical research project whereby 51% of participants expressed interest in a sleep intervention and several of the sample met the threshold for subclinical insomnia, indicates a potential demand for sleep interventions in schools. Depending on resources, this could be through indirect training and support provided to teachers, or directly with students themselves.

Importantly to consider, (most) data for the empirical research project and meta-analysis were collected prior to the COVID-19 pandemic. Therefore, it remains unclear whether there may have been unique effects in relation to the impact of the pandemic

specifically. The uncertainties of the pandemic have undoubtably resulted in unprecedented stress and anxiety for many. Emerging cross-sectional research has found sleep disturbance was highly prevalent among paediatric healthcare workers, and sleep disturbance in these workers was independently associated with being an only child, exposure to COVID-19 patients and depression (Wang et al., 2020). Similarly, symptoms of anxiety and depression since the COVID-19 pandemic have been found to be significantly more common in younger people (aged <35 years) than in older people (Huang & Zhao, 2020). Higher levels of anxiety were also associated with the amount of time spent focussing on news, particularly information related to COVID-19 (Huang & Zhao). Further, research has found COVID-specific worries related to uncertainty are impacting sleep, including fear of catching coronavirus and fear about the future (Zvolensky et al., 2020). Given this impact on anxiety and sleep, it is important for services to consider and respond therapeutically through increased provision of screening (both anxiety and sleep problems) and interventions for sleep, offered via accessible means such as apps/online.

Future Research

Regarding the impact of non-pharmacological sleep interventions on anxiety symptoms, it would be important for future research to investigate combined sleep interventions which were excluded from the current meta-analysis, such as CBT for anxiety combined with CBT-I. This would provide insight into any additional changes in effect sizes for interventions which specifically targeted anxiety. This could be achieved through conducting meta-analyses comparing CBT-I vs CBT-I with additional anxiety-related components. Given the elevated effect size found in the subgroup analysis on physical health, it could be beneficial to explore this further by focusing on specific physical health problems, such as cancer. It could also be beneficial to explore the efficacy of tailored sleep interventions within this population, such as interventions which consider

the physical illness impacts on sleep. It could also be beneficial to understand the effectiveness of combined CBT-I and anxiety interventions in this population. This could be achieved through RCTs or further meta-analyses.

Given the impact of the COVID-19 pandemic, certain pre-sleep thoughts may be related to specific worries in relation to this. The 'rehearsal and planning cognitions' subscale in the Sleep Anticipatory Anxiety Questionnaire (SAAQ) has been found to contribute to poor sleep in both adults and adolescents and focuses on worries not related to sleep (e.g., "I worry about my schoolwork"). This supports findings from our empirical research project which found the planning/rehearsal subscale of the SAAQ was moderately associated with subjective insomnia severity. In the current climate, rehearsal and planning cognitions may relate to different worries including fear of uncertainty, fear of catching the virus, fear of going to work as a keyworker and fear of passing the virus to the elderly (Zvolensky et al., 2020). Future research could explore which COVID-related pre-sleep thoughts may be impacting poor sleep in adolescents and adults.

Future research would also benefit from using the Glasgow Sleep Effort Scale in a larger sample of adolescents to determine the validity and reliability of this measure in this population. Future research may also need to re-observe in larger samples the associations found between different sleep-related thought process measures, given the small sample size in the empirical project.

Reflections

An overall reflection of this thesis portfolio is that it was an ambitious yet rewarding project to complete as part of clinical doctorate training. In the initial planning stages, it was anticipated it may not be feasible for the intervention (Stage 2) to be completed, yet this anticipation was primarily due to concerns about uptake from students or if students did not meet criteria for poor sleep quality. However, the hope that an intervention could still be offered was maintained even several months into the COVID-19

pandemic. In hindsight, it could have been beneficial to let go of the aim of the second part of the project earlier and put full effort into recruiting to possibly gain a larger sample size for cross-sectional data. Several meetings were held during the summer (2020) to discuss how and if there was a possibility of still conducting the intervention stage. This was going to require significant adaptions to materials, requests for software, and changes to our risk plan. What is more, teachers, parents, and students were facing significant stress in adapting to home schooling and learning online. Additionally, adolescents were facing disruptions to usual routines, and school provision was not well organised in the early stages of the pandemic. We discussed the huge impacts this would likely be having on sleep, and that possibly conducting a sleep intervention during this time may not be representative of a typical adolescent experience. At this point, we considered collecting more survey data, which could have provided an opportunity to compare 'pre-COVID' to 'post-COVID' as two different groups, to decipher any differences in subjective sleep and sleep-related thought processes. However, this would have needed significant recruitment which would have been difficult given the recruitment challenges discussed, and the timings on the doctorate course.

After the decision was made to stop recruitment, it was a challenge to amend the aims and research questions initially planned for, and it certainly felt like "researching in reverse". On reflection, despite some challenges, our recruitment process was person-centred and tailored to the individual needs of the schools. We found a way into schools and colleges that worked specifically for them by fitting with a subject and lesson time. Additionally, the two schools that were included in the project were committed and passionate about the study, therefore it felt important to give something back. The decision was made for main author (AS) and second author (HC) to develop a 40-minute Sleep webinar based on CBT-I principles, which was circulated to the schools. In hindsight, this is possibly an area which could have been developed further, through collection of brief

feedback from students and/or teachers which could have complemented our feasibility data. Despite this not receiving formal feedback, schools were appreciative and valued this input.

Overall Conclusion

The meta-analysis and empirical research project presented in this thesis portfolio provide a novel contribution to the literature. The findings add to the current understanding of maintenance factors involved in adolescent insomnia, and the indirect effects of non-pharmacological sleep interventions on anxiety symptoms, as well as effects on sleep-related thought processes. The findings of the meta-analysis suggest despite not directly targeting anxiety, anxiety symptoms can reduce after a targeted sleep intervention. Unhelpful sleep related thought processes also significantly improve. The findings of the empirical research project provide preliminary support for associations between insomnia severity, sleep quality and additional sleep-related thought processes, yet the results must be interpreted with some caution given the small sample size. Overall, these findings highlight the importance of measuring anxiety symptom change and sleep-related thought process change in any future sleep intervention, including with adolescents.

Overall, there were challenges with conducting intervention research, particularly with an adolescent population. This included the uncertainty of uptake for the intervention, the limited sleep measures available for children and adolescents, significant ethical and risk issues needed to be considered, the restriction of school schedules, the busyness of teachers and students, and time constraints involved on the doctorate course. Important lessons learnt were being proactive, having an awareness of timings for school holidays and exams, being mindful of teachers' and students' busy schedules, being flexible in adjusting to schools' preferences and needs, and ensuring the project was of interest and benefited the school.

Finally, both projects within the thesis portfolio outline important areas for further exploration including investigating mechanism interactions involved in adolescent insomnia, considering adapting Paradoxical Intention therapy for adolescents, and understanding the impact of combined sleep and anxiety-based interventions on anxiety and sleep symptoms. The findings have important clinical relevance, including considering the use of non-pharmacological sleep interventions for individuals with anxiety symptoms, and for those with comorbid physical health problems. Moreover, the findings suggest sleep-based interventions may have a broader reach than just targeting sleep symptoms, yet this can only be understood if broader factors are measured. This highlights the importance for future sleep intervention research to measure other factors that may be associated with sleep to provide further insight into the mechanisms underlying the pathways of change.

References

Alfano, C. A., Pina, A. A., Zerr, A. A., & Villalta, I. K. (2010). Pre-sleep arousal and sleep problems of anxiety-disordered youth. Child Psychiatry & Human Development, 41(2), 156-167.

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Arlington, VA: American Psychiatric Publishing.

Arora, T., & Taheri, S. (2015). Associations among late chronotype, body mass index and dietary behaviors in young adolescents. *International journal of obesity*, *39*(1), 39-44.

Bastien, C. H., Vallières, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep medicine*, *2*(4), 297-307.

Belleville, G., Cousineau, H., Levrier, K., & St-Pierre-Delorme, M. È. (2011). Meta-analytic review of the impact of cognitive-behavior therapy for insomnia on concomitant anxiety. Clinical Psychology Review, 31(4), 638-652.

Biggs, S. N., Lushington, K., van den Heuvel, C. J., Martin, A. J., & Kennedy, J. D. (2011). Inconsistent sleep schedules and daytime behavioral difficulties in school-aged children. Sleep medicine, 12(8), 780-786.

Blake, M. J., Sheeber, L. B., Youssef, G. J., Raniti, M. B., & Allen, N. B. (2017). Systematic review and meta-analysis of adolescent cognitive–behavioral sleep interventions. *Clinical child and family psychology review*, *20*(3), 227-249.

Blake, M. J., Trinder, J. A., & Allen, N. B. (2018). Mechanisms underlying the association between insomnia, anxiety, and depression in adolescence: implications for behavioral sleep interventions. Clinical psychology review, 63, 25-40.

Blank, M., Zhang, J., Lamers, F., Taylor, A. D., Hickie, I. B., & Merikangas, K. R. (2015). Health correlates of insomnia symptoms and comorbid mental disorders in a nationally representative sample of US adolescents. *Sleep*, *38*(2), 197-204.

Blunden, S., Crawford, M., & Gregory, A. (2013). Development of a short version of the Dysfunctional Beliefs about Sleep Questionnaire for use with Children (DBAS-C10).

Boergers, J., Gable, C. J., & Owens, J. A. (2014). Later school start time is associated with improved sleep and daytime functioning in adolescents. *Journal of Developmental & Behavioral Pediatrics*, *35*(1), 11-17.

Bootzin, R., Shoham, V., & Kuo, T. (1994). Sleep anticipatory anxiety questionnaire: a measure of anxiety about sleep. *Sleep Res*, *23*, 188.

Bowen, D. J., Kreuter, M., Spring, B., Cofta-Woerpel, L., Linnan, L., Weiner, D., ... & Fernandez, M. (2009). How we design feasibility studies. *American journal of preventive medicine*, *36*(5), 452-457.

Bown, M. J., & Sutton, A. J. (2010). Quality control in systematic reviews and meta-analyses. *European Journal of Vascular and Endovascular Surgery*, *40*(5), 669-677.

Broomfield, N. M., & Espie, C. A. (2005). Towards a valid, reliable measure of sleep effort. *Journal of sleep research*, *14*(4), 401-407.

Broomfield, N., & Espie, C. A. (2002, April). Initial insomnia and paradoxical intention: An experimental investigation of putative mechanisms using subjective and actigraphic measurement of sleep. *Sleep*, *25*, 363-364.

Browne, R. H. (1995). On the use of a pilot sample for sample size determination. *Statistics in medicine*, *14*(17), 1933-1940.

Buysse, D. J., Reynolds III, C. F., 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.

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.

Carpenter, J. K., Andrews, L. A., Witcraft, S. M., Powers, M. B., Smits, J. A., & Hofmann, S. G. (2018). Cognitive behavioral therapy for anxiety and related disorders: A meta-analysis of randomized placebo-controlled trials. *Depression and anxiety*, *35*(6), 502-514. https://doi.org/10.1002/da.22728

Chorpita, B. F., Yim, L., Moffitt, C., Umemoto, L. A., & Francis, S. E. (2000). Assessment of symptoms of DSM-IV anxiety and depression in children: A revised child anxiety and depression scale. *Behaviour research and therapy*, *38*(8), 835-855.

Chung, K. F., Kan, K. K. K., & Yeung, W. F. (2014). Insomnia in adolescents: prevalence, help-seeking behaviors, and types of interventions. *Child and Adolescent Mental Health*, *19*(1), 57-63.

Clarke, G., & Harvey, A. G. (2012). The complex role of sleep in adolescent depression. *Child and Adolescent Psychiatric Clinics*, *21*(2), 385-400.

Cuijpers, P. (2016). Meta-analyses in mental health research. A practical guide. *Amsterdam, the Netherlands: Pim Cuijpers Uitgeverij*.

Daley, M., Morin, C. M., LeBlanc, M., Grégoire, J. P., Savard, J., & Baillargeon, L. (2009). Insomnia and its relationship to health-care utilization, work absenteeism, productivity and accidents. Sleep medicine, 10(4), 427-438.

Danielsson, K., Sakarya, A., & Jansson-Fröjmark, M. (2019). The reduced Morningness–Eveningness Questionnaire: Psychometric properties and related factors in a young Swedish population. *Chronobiology international*, *36*(4), 530-540.

Data Protection Act 2018, c. 12 Available at: http://www.legislation.gov.uk/ukpga/2018/12/contents/enacted (Accessed: 2 December 2019).

Duncan, B. L., & Miller, S. D. (2000). The client's theory of change: Consulting the client in the integrative process. *Journal of Psychotherapy Integration*, *10*(2), 169-187.

Ebesutani, C., Okamura, K., Higa-McMillan, C., & Chorpita, B. F. (2011). A psychometric analysis of the Positive and Negative Affect Schedule for Children–Parent Version in a school sample. *Psychological assessment*, *23*(2), 406.

Edinger, J. D., & Wohlgemuth, W. K. (2001). Psychometric comparisons of the standard and abbreviated DBAS-10 versions of the dysfunctional beliefs and attitudes about sleep questionnaire. *Sleep medicine*, *2*(6), 493-500.

Eldridge, S. M., Chan, C. L., Campbell, M. J., Bond, C. M., Hopewell, S., Thabane, L., & Lancaster, G. A. (2016). CONSORT 2010 statement: extension to randomised pilot and feasibility trials. *bmj*, *355*.

Fagard, R. H., Staessen, J. A., & Thijs, L. (1996). Advantages and disadvantages of the meta-analysis approach. *Journal of hypertension. Supplement: official journal of the International Society of Hypertension*, *14*(2), S9-12.

Ford, D. E., & Kamerow, D. B. (1989). Epidemiologic study of sleep disturbances and psychiatric disorders: an opportunity for prevention?. Jama, 262(11), 1479-1484.

Fuligni, A. J., & Hardway, C. (2006). Daily variation in adolescents' sleep, activities, and psychological well-being. Journal of Research on Adolescence, 16(3), 353-378.

Gariépy, G., Riehm, K. E., Whitehead, R. D., Doré, I., & Elgar, F. J. (2019). Teenage night owls or early birds? Chronotype and the mental health of adolescents. *Journal of sleep research*, *28*(3), e12723.

Gee, B., Orchard, F., Clarke, E., Joy, A., Clarke, T., & Reynolds, S. (2019). The effect of non-pharmacological sleep interventions on depression symptoms: A meta-analysis of randomised controlled trials. Sleep medicine reviews, 43, 118-128.

Gradisar, M., Wolfson, A. R., Harvey, A. G., Hale, L., Rosenberg, R., & Czeisler, C. A. (2013). The sleep and technology use of Americans: findings from the National Sleep Foundation's 2011 Sleep in America poll. Journal of Clinical Sleep Medicine, 9(12), 1291-1299.

Gulec, M., Selvi, Y., Boysan, M., Aydin, A., Oral, E., & Aydin, E. F. (2013). Chronotype effects on general well-being and psychopathology levels in healthy young adults. *Biological Rhythm Research*, *44*(3), 457-468.

Hariton, E., & Locascio, J. J. (2018). Randomised controlled trials—the gold standard for effectiveness research. *BJOG: an international journal of obstetrics and gynaecology*, *125*(13), 1716.

Harvey, A. G. (2002). A cognitive model of insomnia. Behaviour research and therapy, 40(8), 869-893.

Hertzog, M. A. (2008). Considerations in determining sample size for pilot studies. *Research in nursing & health*, *31*(2), 180-191.

Horne, J. A., & Östberg, O. (1976). A self-assessment questionnaire to determine morningness-eveningness in human circadian rhythms. *International journal of chronobiology*.

Huang, Y., & Zhao, N. (2020). Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: a web-based cross-sectional survey. *Psychiatry research*, *288*, 112954.

Hysing, M., Harvey, A. G., Linton, S. J., Askeland, K. G., & Sivertsen, B. (2016). Sleep and academic performance in later adolescence: Results from a large population-based study. Journal of sleep research, 25(3), 318-324.

Hysing, M., Pallesen, S., Stormark, K. M., Lundervold, A. J., & Sivertsen, B. (2013). Sleep patterns and insomnia among adolescents: a population-based study. *Journal of sleep research*, *22*(5), 549-556.

Johnson, E. O., Roth, T., Schultz, L., & Breslau, N. (2006). Epidemiology of DSM-IV insomnia in adolescence: lifetime prevalence, chronicity, and an emergent gender difference. Pediatrics, 117(2), e247-e256.

Katz, D. A., & McHorney, C. A. (2002). The relationship between insomnia and health-related quality of life in patients with chronic illness. Journal of Family Practice, 51(3), 229-234.

Kirby, M., Maggi, S., & D'Angiulli, A. (2011). School start times and the sleep–wake cycle of adolescents: a review and critical evaluation of available evidence. *Educational Researcher*, *40*(2), 56-61.

Kriston, L. (2013). Dealing with clinical heterogeneity in meta-analysis. Assumptions, methods, interpretation. *International journal of methods in psychiatric research*, *22*(1), 1-15.

Lancaster, G. A., Dodd, S., & Williamson, P. R. (2004). Design and analysis of pilot studies: recommendations for good practice. *Journal of evaluation in clinical practice*, *10*(2), 307-312.

Leger, D., Bayon, V., Ohayon, M. M., Philip, P., Ement, P., Metlaine, A., ... & Faraut, B. (2014). Insomnia and accidents: cross-sectional study (EQUINOX) on sleep-related home, work and car accidents in 5293 subjects with insomnia from 10 countries. Journal of sleep research, 23(2), 143-152.

Lewis, S., & Clarke, M. (2001). Forest plots: trying to see the wood and the trees. *Bmj*, *322*(7300), 1479-1480.

Lovato, N., & Gradisar, M. (2014). A meta-analysis and model of the relationship between sleep and depression in adolescents: recommendations for future research and clinical practice. Sleep medicine reviews, 18(6), 521-529.

McMakin, D. L., & Alfano, C. A. (2015). Sleep and anxiety in late childhood and early adolescence. Current Opinion in Psychiatry, 28(6), 483.

Minozzi, S., Cinquini, M., Gianola, S., Gonzalez-Lorenzo, M., & Banzi, R. (2020). The revised Cochrane risk of bias tool for randomized trials (RoB 2) showed low interrater reliability and challenges in its application. *Journal of clinical epidemiology*, *126*, 37-44. https://doi.org/10.1016/j.jclinepi.2020.06.015

Morin, C. M., Vallières, A., & Ivers, H. (2007). Dysfunctional beliefs and attitudes about sleep (DBAS): validation of a brief version (DBAS-16). *Sleep*, *30*(11), 1547-1554.

National Institute of Health and Care Excellence (NICE). (2015). Insomnia. Available at: Insomnia | Health topics A to Z | CKS | NICE.

NICE. (2011). National Institute of Clinical Excellence: Improving Access to Psychological Therapies. *Retrieved from*: Overview | Common mental health problems: identification and pathways to care | Guidance | NICE

Orchard, F., Pass, L., Chessell, C., Moody, A., Ellis, J., & Reynolds, S. (2020). Adapting Brief CBT-I for Depressed Adolescents: A case illustration of the sleeping better program. *Cognitive and Behavioral Practice*, *27*(3), 336-346.

Pasch, K. E., Laska, M. N., Lytle, L. A., & Moe, S. G. (2010). Adolescent sleep, risk behaviors, and depressive symptoms: are they linked?. American journal of health behavior, 34(2), 237-248.

Razali, N. M., & Wah, Y. B. (2011). Power comparisons of shapiro-wilk, kolmogorov-smirnov, lilliefors and anderson-darling tests. *Journal of statistical modeling and analytics*, *2*(1), 21-33.

Reed, D. L., & Sacco, W. P. (2016). Measuring sleep efficiency: what should the denominator be?. *Journal of clinical sleep medicine*, *12*(2), 263-266.

Richter, K., Acker, J., Adam, S., & Niklewski, G. (2016). Prevention of fatigue and insomnia in shift workers—a review of non-pharmacological measures. EPMA journal, 7(1), 1-11.

Riemann, D., Baglioni, C., Bassetti, C., Bjorvatn, B., Dolenc Groselj, L., Ellis, J. G., ... & Spiegelhalder, K. (2017). European guideline for the diagnosis and treatment of insomnia. *Journal of sleep research*, *26*(6), 675-700.

Roenneberg, T., Kuehnle, T., Pramstaller, P. P., Ricken, J., Havel, M., Guth, A., & Merrow, M. (2004). A marker for the end of adolescence. *Current biology*, *14*(24), R1038-R1039.

Roth, T. (2007). Insomnia: definition, prevalence, etiology, and consequences. Journal of clinical sleep medicine, 3(5 suppl), S7-S10.

Russo, P. M., Biasi, V., Cipolli, C., Mallia, L., & Caponera, E. (2017). Sleep habits, circadian preference, and school performance in early adolescents. *Sleep medicine*, *29*, 20-22.

Sharma, M. P., & Andrade, C. (2012). Behavioral interventions for insomnia: Theory and practice. Indian journal of psychiatry, 54(4), 359. https://dx.doi.org/10.4103%2F0019-5545.104825

Simon, G. E., & VonKorff, M. (1997). Prevalence, burden, and treatment of insomnia in primary care. American Journal of Psychiatry, 154(10), 1417-1423.

Spielman, A. J., Caruso, L. S., & Glovinsky, P. B. (1987). A behavioral perspective on insomnia treatment. *Psychiatric Clinics of North America*, *10*(4), 541-553.

Spielman, A. J., Saskin, P., & Thorpy, M. J. (1987). Treatment of chronic insomnia by restriction of time in bed. *Sleep*, *10*(1), 45-56.

Stallard, P., Udwin, O., Goddard, M., & Hibbert, S. (2007). The availability of cognitive behaviour therapy within specialist child and adolescent mental health services (CAMHS): A national survey. Behavioural and Cognitive Psychotherapy, 35(4), 501.

Tennant, R., Hiller, L., Fishwick, R., Platt, S., Joseph, S., Weich, S., ... & Stewart-Brown, S. (2007). The Warwick-Edinburgh mental well-being scale (WEMWBS): development and UK validation. *Health and Quality of life Outcomes*, *5*(1), 1-13.

Thabane, L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L. P., ... & Goldsmith, C. H. (2010). A tutorial on pilot studies: the what, why and how. *BMC medical research methodology*, *10*(1), 1-10.

Thakral, M., Von Korff, M., McCurry, S. M., Morin, C. M., & Vitiello, M. V. (2020). Changes in dysfunctional beliefs about sleep after cognitive behavioral therapy for

insomnia: A systematic literature review and meta-analysis. *Sleep Medicine Reviews*, *49*, 101230. https://doi.org/10.1016/j.smrv.2019.101230

The NHS Long Term Plan. (2019). Retrieved from: NHS Long Term Plan » The NHS Long Term Plan

Turner, R. M., & Ascher, L. M. (1979). Controlled comparison of progressive relaxation, stimulus control, and paradoxical intention therapies for insomnia. Journal of Consulting and Clinical Psychology, 47(3), 500. https://psycnet.apa.org/doi/10.1037/0022-006X.47.3.500

Wang, S., Xie, L., Xu, Y., Yu, S., Yao, B., & Xiang, D. (2020). Sleep disturbances among medical workers during the outbreak of COVID-2019. *Occupational Medicine*, *70*(5), 364-369.

Wheaton, A. G., Chapman, D. P., & Croft, J. B. (2016). School start times, sleep, behavioral, health, and academic outcomes: a review of the literature. *Journal of School Health*, *86*(5), 363-381.

Wittmann, M., Dinich, J., Merrow, M., & Roenneberg, T. (2006). Social jetlag: misalignment of biological and social time. *Chronobiology international*, *23*(1-2), 497-509.

Wolfson, A. R., & Carskadon, M. A. (1998). Sleep schedules and daytime functioning in adolescents. Child development, 69(4), 875-887.

World Health Organization. (2015). Maternal, new born, child and adolescent health. Retrieved from: WHO | Health for the world's adolescents

Wyatt, J. K., & Cvengros, J. A. (2012). Delayed and Advanced Sleep Phase Disorders. *Therapy in Sleep Medicine*, 402-410.

Zerbini, G., van der Vinne, V., Otto, L. K., Kantermann, T., Krijnen, W. P., Roenneberg, T., & Merrow, M. (2017). Lower school performance in late chronotypes: underlying factors and mechanisms. Scientific reports, 7(1), 1-10.

Zvolensky, M. J., Garey, L., Rogers, A. H., Schmidt, N. B., Vujanovic, A. A., Storch, E. A., ... & O'Cleirigh, C. (2020). Psychological, addictive, and health behavior implications of the COVID-19 pandemic. *Behaviour research and therapy*, *134*, 103715.

Appendices

Appendix A. Author Guidelines for Journal of Sleep Research

Author Guidelines

Manuscript Submission
The Journal of Sleep Research receives all manuscript submissions electronically via its submission and review website.

The Journal of Sleep Research employs a plagiarism detection system. By submitting your manuscript to this journal you accept that your manuscript may be screened for plagiarism against previously published works.

Pre-submission English-language editing: If you are not a native English-language speaker, we strongly recommend that you have your manuscript professionally edited before submission. A list of companies that will edit your manuscript for a fee can be found **here**. Professional editing is not compulsory, but will mean that reviewers are better able to read and assess your manuscript. Use of one of these companies does not guarantee acceptance or preference for publication in this journal.

Article Preparation Support: **Wiley Editing Services** offers expert help with English Language Editing, as well as translation, manuscript formatting, figure illustration, figure formatting, and graphical abstract design – so you can submit your manuscript with confidence.
Also, check out our resources for **Preparing Your Article** for general guidance about writing and preparing your manuscript.

To submit a manuscript, please follow the instructions below.

Preprint policy:

Please find the Wiley preprint policy **here**.

This journal accepts articles previously published on preprint servers.

This journal will consider for review articles previously available as preprints on non-commercial servers such as ArXiv, bioRxiv, psyArXiv, SocArXiv, engrXiv, etc. Authors may also post the submitted version of a manuscript to non-commercial servers at any time. Authors are requested to update any pre-publication versions with a link to the final published article.

Data Sharing and Data Accessibility

Please review Wiley's policy **here**. This journal expects data sharing.

Journal of Sleep Research recognizes the many benefits of archiving research data. *Journal of Sleep Research* expects you to archive all the data from which your published results are derived in a public repository. The repository that you choose should offer you guaranteed preservation (see the registry of research data repositories at **https://www.re3data.org/**) and should help you make it findable, accessible, interoperable, and re-useable, according to FAIR Data Principles (**https://www.force11.org/group/fairgroup/fairprinciples**).

All accepted manuscripts are required to publish a data availability statement to confirm the presence or absence of shared data. If you have shared data, this statement will describe how the data can be accessed, and include a persistent identifier (e.g., a DOI for the data, or an accession number) from the repository where you shared the data. Authors will be required to confirm adherence to the policy. If you cannot share the data described in your manuscript, for example for legal or ethical reasons, or do not intend to share the data then you must provide the appropriate data availability statement. *Journal of Sleep Research* notes that FAIR data sharing allows for access to shared data under restrictions (e.g., to protect confidential or

proprietary information) but notes that the FAIR principles encourage you to share data in ways that are as open as possible (but that can be as closed as necessary).

Sample statements are available **here**. If published, all statements will be placed in the heading of your manuscript.

Getting Started

1. Launch your web browser (Internet Explorer 5 or higher) and go to the journal's **ScholarOne** Manuscripts homepage (**http://mc.manuscriptcentral.com/josr** - please note the acronym). Click the "Create Account" option if you are a first-time user of ScholarOne Manuscripts.
2. After clicking on "Create Account", enter your name and e-mail information and click "Next". Your e-mail information is very important.
3. Enter your institution and address information as appropriate, and then click "Next".
4. Enter a user ID and password of your choice (we recommend using your e-mail address as your user ID), and then select your area of expertise.
5. Click "Finish".
6. Log-in and select "Author Center".

Submitting your manuscript

1. After you have logged in, click the "Submit a Manuscript" link in the menu bar.
2. Enter data and answer the questions as appropriate.
3. Click the "Next" button on each screen to save your work and advance to the next screen.

You are then required to upload your files:

4. Click on the "Browse" button and locate the file on your computer.
5. Select the designation of each file in the drop down next to the Browse button.
6. When you have selected all files you wish to upload (in groups of 3), click the "Upload Files" button.
7. Review your submission (in both PDF and HTML formats) before sending to the Journal. Click the "Submit" button when you are finished reviewing.

You may suspend a submission at any phase before clicking the "Submit" button and save it to submit later. After submission, you will receive a confirmation e-mail. You can also access ScholarOne Manuscripts any time to check the status of your manuscript. The Journal will inform you by e-mail once a decision has been made.

Manuscript Style

There are several categories of material:

Commentaries and editorials

The Editor may invite editorials and commentaries. The Journal will not consider unsolicited editorials or commentaries. Editorials should be approximately 800-1000 words and contain no more than 10 references. The title for an editorial should not exceed 85 characters.

Short Papers

These should be less than 2000 words in length (including abstract, keywords and main text), with a maximum of four figures or tables and 15 references. Short papers are rapidly reviewed and published.

Fast Track Papers

These should contain very new "hot off the press" research results of high interest for the research community. These should be less than 2000 words in length (including abstract, keywords and main text), with a maximum of four figures or tables and 15 references. Fast Track Papers will be rapidly reviewed and published.

Regular Research Papers

These are of a more usual length 3000-5000 words (including abstract, keywords and main text), with a maximum of 40 references, and will contain original basic or clinical research findings.

Regular Review Papers
The Editor encourages the uninvited submission of review papers, but the Editor also will specifically invite review papers. Review papers are intended to be well argued, critical reviews of topical subjects which will generate debate and provide direction for future research on the topic.

Letters to the Editor
The Editor welcomes succinct correspondence relating to articles published in the journal, and of an academic and interesting nature.

Title Page

This should contain a concise title of the article, a shortened version (no more than 50 characters including spaces) for the running head, names of the authors, their affiliations, and the full postal and e-mail address, fax and telephone number of an author to whom correspondence can be addressed.

Total number of words, and number of references should be indicated on the Title Page.

Conflict of interests - disclosure of any personal of financial support and author involvement with organization(s) with financial interest in the subject matter of the paper, or any actual or potential conflict of interest-and if no conflict exist, a statement must be included for each author.

Author contributorship - include information about the contributions of each author to the work.

Abstract

This should be on a separate page, and less than 250 words. It should be followed by up to six keywords that are **different** from those already present in the title and abstract. It should not be structured. Abbreviations should not be used in the abstract.

Main Text

All text must be 1.5- or double-spaced. It should start on a separate page, and include an introduction (approximately 500 words for Regular Research papers) , methods, results and discussion (less than 1000 words for Regular Research Papers). The suggested points of insertion of figures and tables, etc., should be indicated. Authors should avoid abbreviations (except for those commonly understood), long sentences, and many juxtaposed numbers in sentences. Authors should also avoid sending in main text files in Portable Document Format (PDF).

References

References should be prepared according to the Publication Manual of the American Psychological Association (6th edition). This means in text citations should follow the author-date method whereby the author's last name and the year of publication for the source should appear in the text, for example, (Jones, 1998). The complete reference list should appear alphabetically by name at the end of the paper. A sample of the most common entries in reference lists appears below. Please note that a DOI should be provided for all references where available. For more information about APA referencing style, please refer to the **APA FAQ**. Please note that for journal articles, issue numbers are not included unless each issue in the volume begins with page one.

Journal article

Beers, S. R. , & De Bellis, M. D. (2002). Neuropsychological function in children with maltreatment-related posttraumatic stress disorder. The American Journal of Psychiatry, 159, 483–486. **doi:10.1176/appi.ajp.159.3.483**

Book

Bradley-Johnson, S. (1994). Psychoeducational assessment of students who are visually impaired or blind: Infancy through high school (2nd ed.). Austin, TX: Pro-ed.

Internet Document

Tedx Talks. (2013, June 28). *Sleep: Professor Conor Heneghan at TEDxUCD* [Video file]. Retrieved from **https://youtu.be/QCVP-LhdI0I**

An EndNote template file for the *Journal of Sleep Research* can be obtained **here**.

Supporting Information

Supporting Information can be a useful way for an author to include important but ancillary information with the online version of an article. Examples of Supporting Information include additional tables, data sets, figures, movie files, audio clips, 3D structures, and other related nonessential multimedia files. Supporting Information should be cited within the article text, and a descriptive legend should be included. It is published as supplied by the author, and a proof is not made available prior to publication; for these reasons, authors should provide any Supporting Information in the desired final format.

For further information on recommended file types and requirements for submission, please visit: **http://authorservices.wiley.com/bauthor/suppinfo.asp**

Illustrations

Great care should be taken in the preparation of the illustrations. They should be referred to in the text as figures using Arabic numbers, e.g. Fig. 1, Fig. 2, etc., in order of appearance. Each figure should be labelled with its appropriate number.

In the full-text online edition of the journal, figure legends may be truncated in abbreviated links to the full screen version. Therefore, the first 100 characters of any legend should inform the reader of key aspects of the figure.

To ensure accurate conversion of characters, standard fonts such as Times, Times New Roman, Ariel or Helvetica should be used for preparing the text and figures. Use of bold fonts should be avoided. Please save vector graphics (e.g. line artwork) in Encapsulated PostScript Format (EPS), and bitmap files (e.g. half-tones) in Tagged Image File Format (TIFF). These should be at a resolution of at least 300 dpi at final size. Ideally, vector graphics that have been saved in metafile (.WMF) or pict (.PCT) format should be embedded within the body of the text file. Illustrations may also be submitted in PDF format. Detailed information on our digital illustration standards is available **here.**

There will be no charges for colour illustrations.

Tables

These should include only essential data. Each table must be typewritten on a separate sheet and should be numbered consecutively in Arabic numerals, e.g. Table 1, and given a short caption. Tables should not be submitted in PDF format.

Acknowledgements

These should be brief and must include references to sources of financial and logistical support.

Units

Measurements must be in SI units. Units, Symbols and Abbreviations (Royal Society of Medicine, 1988) is a useful guide.

Copyright Assignment

If your paper is accepted, the author identified as the formal corresponding author for the paper will receive an email prompting them to login into Author Services; where via the Wiley Author Licensing Service (WALS) they will be able to complete the license agreement on behalf of all authors on the paper.

For authors signing the Copyright Transfer Agreement
If the Open Access option is not selected the corresponding author will be presented with the Copyright Transfer Agreement to sign. The terms and conditions of the Copyright Transfer Agreement can be previewed below:

Terms and Conditions are **here**. Please do not complete this PDF until you are prompted to login into Author Services as described above.

Note to Contributors on Deposit of Accepted Version
Funder arrangements
Certain funders, including the NIH, members of the Research Councils UK (RCUK) and Wellcome Trust require deposit of the Accepted Version in a repository after an embargo period. Details of funding arrangements are set out at the following website: **http://www.wiley.com/go/funderstatement**. Please contact the Journal production editor if you have additional funding requirements.

Institutions
Wiley has arrangements with certain academic institutions to permit the deposit of the Accepted Version in the institutional repository after an embargo period. Details of such arrangements are set out at the following website: **http://www.wiley.com/go/funderstatement**

For authors choosing Open Access
If the Open Access option is selected the corresponding author will have a choice of the following Creative Commons License Open Access Agreements (OAA):

Creative Commons Attribution Non-Commercial License OAA
Creative Commons Attribution Non-Commercial -NoDerivs License OAA

To preview the terms and conditions of these open access agreements please visit the Copyright FAQs hosted on Wiley Author Services **http://authorservices.wiley.com/bauthor/faqs_copyright.asp** and visit **http://www.wileyopenaccess.com/details/content/12f25db4c87/Copyright--License.html.**

If you select the Open Access option and your research is funded by The Wellcome Trust and members of the Research Councils UK (RCUK) you will be given the opportunity to publish your article under a CC-BY license supporting you in complying with Wellcome Trust and Research Councils UK requirements. For more information on this policy and the Journal's compliant self-archiving policy please visit: **http://www.wiley.com/go/funderstatement**.

For RCUK and Wellcome Trust authors click on the link below to preview the terms and conditions of this license:

Creative Commons Attribution License OAA

To preview the terms and conditions of these open access agreements please visit the Copyright FAQs hosted on Wiley Author Services **http://authorservices.wiley.com/bauthor/faqs_copyright.asp** and visit **http://www.wileyopenaccess.com/details/content/12f25db4c87/Copyright--License.html**

Author Services

NEW: Online production tracking is now available for your article through Wiley Blackwell's Author Services.

Author Services enables authors to track their article - once it has been accepted - through the production process to publication. Authors can check the status of their articles online and

choose to receive automated e-mails at key stages of production. The author will receive and e-mail with a unique link that enables them to register and have their article automatically added to the system. Please ensure that a complete e-mail address is provided when submitting the manuscript. Visit **http://authorservices.wiley.com/bauthor** for more details on online production tracking and for a wealth of resources including FAQs and tips on article preparation, submission and more.

Page Proofs

Authors will receive an e-mail notification with a link and instructions for accessing HTML page proofs online. Page proofs should be carefully proofread for any copyediting or typesetting errors. Online guidelines are provided within the system. No special software is required, all common browsers are supported. Authors should also make sure that any renumbered tables, figures, or references match text citations and that figure legends correspond with text citations and actual figures. Proofs must be returned within 48 hours of receipt of the email. Return of proofs via e-mail is possible in the event that the online system cannot be used or accessed.

Updated Author Name Change policy

In cases where authors wish to change their name following publication, Wiley will update and republish the paper and redeliver the updated metadata to indexing services. Our editorial and production teams will use discretion in recognizing that name changes may be of a sensitive and private nature for various reasons including (but not limited to) alignment with gender identity, or as a result of marriage, divorce, or religious conversion. Accordingly, to protect the author's privacy, we will not publish a correction notice to the paper, and we will not notify co-authors of the change. Authors should contact the journal's Editorial Office with their name change request.

Early View

The *Journal of Sleep Research* is covered by Wiley Blackwell's Early View service. Early View articles are complete full-text articles published online in advance of their publication. Articles are therefore available as soon as they are ready, rather than having to wait for the next scheduled issue. Early View articles are complete and final. They have been fully reviewed, revised and edited for publication, and the authors' final corrections have been incorporated. Because they are in final form, no changes can be made after Early View publication. The nature of Early View articles means that they do not yet have volume, issue or page numbers, so Early View articles cannot be cited in the traditional way. They are therefore given a Digital Object Identifier (DOI), which allows the article to be cited and tracked before it is allocated to an issue. After publication, the DOI remains valid and can continue to be used to cite and access the article.

Article Promotion Support

Wiley Editing Services offers professional video, design, and writing services to create shareable video abstracts, infographics, conference posters, lay summaries, and research news stories for your research – so you can help your research get the attention it deserves.

Reprints

The corresponding author will receive a pdf 'reprint' of his or her article. Printed copies can be ordered with the return of proofs.

Accessing Your Free PDF Offprint

Free access to the final PDF offprint or your aritcle will be available via Author Services only. Please therefore sign up for Author Services if you would like to access your article PDF offprint and enjoy the many other benefits the service offers.

Author material archive policy

Please note that unless specifically requested, Wiley Blackwell will dispose of all hardcopy or electronic material submitted, two months after publication. If you require the return of any material submitted, please inform the editorial office or production editor as soon as possible if you have not yet done so.

eLocators

The journal now uses eLocators. For more information, please visit the Author Services eLocator page **here**

Appendix B. PRISMA (2009) Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	18
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	19
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	24
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	25
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	26
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	26-27
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	26
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	26 & 180
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	28
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	28

Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	26
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	28
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	29
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	29-30
Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	28
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	29
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	30-31
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	32-43
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	44 & 106
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	45
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	45 & 48
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	51
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	49 & 109

DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	51
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	55
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	54 & 57
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	Y

Appendix C. Full Database Search (Medline)

#	Query	Limiters/Expanders	Last Run Via	Results
S62	TI sleep	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S61	TI insomnia	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S60	TI (MH "Sleep+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S59	(MH "Sleep Initiation and Maintenance Disorders+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S58	TI "sleep disorder*"	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S57	S62 OR S61 OR S60 OR S59 OR S58	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S56	"cognitive behavio* therap*"	Expanders - Apply related words; Apply equivalent	Interface - EBSCOhost	Display

		subjects Search modes - Find all my search terms	Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	
S55	CBT*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S54	(non-pharmacolog*) N3 (interven* OR treat*)	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S53	education	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S52	hygiene	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S51	(MH "Cognitive Therapy+") OR (MH "Behavior Therapy+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S50	S56 OR S55 OR S54 OR S53 OR S52 OR S51	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S49	TI anxi* OR AB anxi*	Expanders - Apply related words; Apply equivalent subjects	Interface - EBSCOhost Research	Display

		Search modes - Find all my search terms	Databases Search Screen - Advanced Search Database - MEDLINE Complete	
S48	TI GAD OR AB GAD	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S47	TI GAD-7 OR AB GAD-7	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S46	(MH "Anxiety+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S45	S49 OR S48 OR S47 OR S46	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S44	S57 AND S50 AND S45	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S43	S57 AND S50 AND S45	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Complete	Display
S42	TI sleep	Expanders - Apply related words; Apply equivalent subjects	Interface - EBSCOhost Research Databases	Display

		Search modes - Find all my search terms	Search Screen - Advanced Search Database - APA PsycInfo	
S41	TI insomnia	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S40	DE "Sleep"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S39	DE "Insomnia"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S38	TI "sleep disorder*"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S37	S42 OR S41 OR S40 OR S39 OR S38	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S36	(non-pharmacolog*) N3 (interven* OR treat*)	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S35	"cognitive behavio* therap*"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen -	Display

			Advanced Search Database - APA PsycInfo	
S34	CBT*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S33	education	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S32	(DE "Cognitive Therapy+") OR (DE "Behavior Therapy+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S31	(DE "Cognitive Therapy+") OR (DE "Behavior Therapy+")	Expanders - Apply related words; Apply equivalent subjects Search modes - SmartText Searching	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S30	hygiene	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S29	S36 OR S35 OR S34 OR S33 OR S31 OR S30	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S28	TI anxi* OR AB anxi*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search	Display

			Database - APA PsycInfo	
S27	TI GAD OR AB GAD	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S26	TI GAD-7 OR AB GAD-7	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S25	DE Anxiety	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S24	S28 OR S27 OR S26 OR S25	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S23	S37 AND S29 AND S24	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S22	S37 AND S29 AND S24	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo	Display
S21	S6 AND S17 AND S20	Limiters - Published Date: 20201001-20210231 Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search	Display

			Database - CINAHL Complete	
S20	S7 OR S8 OR S9 OR S10 OR S11 OR S19	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S19	hygiene	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S18	S6 AND S12 AND S17	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S17	S13 OR S14 OR S15 OR S16	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S16	(MH "Anxiety+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S15	TI GAD-7 OR AB GAD-7	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S14	TI GAD OR AB GAD	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search	Display

			Database - CINAHL Complete	
S13	TI anxi* OR AB anxi*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S12	S7 OR S8 OR S9 OR S10 OR S11	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S11	(MH "Cognitive Therapy+") OR (MH "Behavior Therapy+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S10	education	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S9	CBT*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S8	"cognitive behavio* therap*"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S7	(non-pharmacolog*) N3 (interven* OR treat*)	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search	Display

			Database - CINAHL Complete	
S6	S1 OR S2 OR S3 OR S4 OR S5	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S5	TI "sleep disorder*"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S4	(MH "Insomnia+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S3	(MH "Sleep+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S2	TI insomnia	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display
S1	TI sleep	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	Display

Appendix D. Exclusion Coding Table

1	No anxiety measure
2	Control included a sleep intervention
3	The study was not an RCT (e.g. no control group, protocol)
4	Sleep intervention included a pharmacological component (including herbal medicines)
5	Anxiety subscale of a measure is not separated out
6	Found to be a duplicate
7	Secondary data analysis of included study
8	Not peer reviewed journal
9	No post data recorded for anxiety measure
10	Main intervention not a primarily focused sleep intervention (or is combined e.g. anxiety & sleep)
11	Follow up data was longitudinal
12	Measure used is not measuring "anxiety symptoms" e.g. PSWQ
13	Full text not available in English language
14	(Study still ongoing)
15	Abstract synopsis only available

Appendix E. Data Entered for Meta-analysis

Overall Meta-Analysis

Study	Moderator	N1	N2	D
Thorndike (2013)		22	22	-0.29
Casault (2015)		20	18	-0.005
Espie (2014)		55	54	-0.5
Bergdahl (2017)		25	24	-0.29
Nguyen (2017)		13	11	-0.69
McCrae (2019)		39	37	-0.69
Jansson-Fröjmark (2012)		17	15	-1.29
Sunnhed (2020)		73	74	-0.76
van der Zweerde (2017)		52	52	-0.49
McCrae (2018)		32	30	-0.31
Siengsukon (2020)		12	10	-0.25
Lancee (2016)		30	30	-1.67
Taylor (2018)		65	61	-0.06
Ritterband (2012)		14	14	-0.23
Morris (2016)		48	47	-0.53
Lancee (2012)		214	200	-0.33
Denis (2020)		67	78	-0.07
Black (2015)		25	24	-0.04
Horsch (2017)		45	62	-0.63
Harris (2019)		12	11	-0.13
Smitherman (2016)		16	15	-0.08
Lorenz (2018)		25	27	-0.33
Friedrich (2018)		28	13	-0.07
McGrath (2017)		54	67	-0.45
Lancee (2015)		32	22	-0.39
Chapoutot (2020)		15	15	-0.15
Gieselmann (2019)		24	19	-0.52
Kyle (2020)		155	181	-0.35
Ho (2014)		58	65	-0.13
Mimeault (1999)		18	18	-0.53
Freeman (2017)		733	1142	-0.31
Xing (2020)		32	31	-0.03
de Bruin (2018)		38	39	-0.53
Carney (2006)		16	17	-0.55
Huang (2013)		46	46	-0.93
Blake (2016)		63	60	-0.01
Rybarczyk (2005)		11	13	-0.33
Espie (2008)		74	41	-0.57
Matthews (2014)		30	26	-0.42
Yeung (2018)		16	15	-0.11

Batterham (2017)	248	333	-0.5
Van der Zweerde (2020)	69	65	-0.04
Barati (2020)	37	37	-0.34

Subgroup – mental health

Study	Moderator	N1	N2	D
Thorndike (2013)		22	22	-0.29
Van der zweerde (2019)		52	52	-0.49
Morris (2016)		48	47	-0.53
Rybarczyk (2005)		11	13	-0.33
Batterham (2017)		248	333	-0.5
Barati (2020)		37	37	-0.34

Subgroup – physical health

Author	Study	N1	N2	ES - D
Casault (2015)	Casault (2015)	20	18	-0.005
Nguyen (2017)	Nguyen (2017)	13	11	-0.69
McCrae (2019)	McCrae (2019)	39	37	-0.69
Jansson-Fröjmark (2012)	Jansson-Fröjmark (2012)	17	15	-1.29
Siengsukon (2020)	Siengsukon (2020)	12	10	-0.25
Ritterband (2012)	Ritterband (2012)	14	14	-0.23
Harris (2019)	Harris (2019)	12	11	-0.13
Smitherman (2016)	Smitherman (2016)	16	15	-0.08
McGrath (2017)	McGrath (2017)	67	67	-0.45
Matthews (2014)	Matthews (2014)	30	26	-0.42
Espie (2008)	Espie (2008)	74	41	-0.57

Sleep related thought-related thought processes meta-analysis

Study	Moderator	N1	N2	d
McCrae (2019)		39	37	-0.88
Denis (2020)		67	78	-1.6
Horsch (2017)		45	62	-0.07
Lancee (2015)		36	27	-0.84
Gieselmann (2019)		27	22	-0.96
Mimeault (1999)		18	18	-1.48
Matthews (2014)		30	26	-0.4
Xing (2020)		32	31	-0.66
Carney (2006)		16	17	-1.55
Rybarczyk (2005)		11	13	-1.31

Appendix F. Stage 1 - Young Person's Participant Information Sheet

Norwich Medical School
Faculty of Medicine and Health Sciences
University of East Anglia
Norwich
NR4 7TJ
Email: H.Cowie@uea.ac.uk
A.staines@uea.ac.uk
Tel: +44 (0) 1603 59xxxx
Web: www.uea.ac.uk

Stage 1: Sleep Survey
Young Person Information Sheet

Hello, we are inviting you to take part in our research project!

Why is this project being done?

We want to understand what young people's sleep is like at your school, so the right kind of support can be offered.

Why have I been asked to take part?

You have been asked to take part because your school has agreed to be part of this project. We are inviting you because you are aged between 11 and 18 years old.

Do I have to take part?

No. You do not have to take part unless you want to. Also, if you decide to take part and then change your mind, this won't matter at all. You can withdraw from the study at any point, without giving a reason.

What will happen if I take part in the project?

First, we will give you a chance to ask any questions, so that you can decide if you would like to take part. We will then ask you to fill in a consent form:

- **If you are under 16**, we will need to check that it is ok for you to take part with your parent/guardian. They can opt you out of the study by filling in our "opt out form" which will be sent to them too. Your parent will also get a Parent Information sheet, just like this one
- **If you are 16-18** you can consent to take part yourself

We would then like you to complete some brief questionnaires about your sleep, feelings, wellbeing and thinking styles. They will take around an hour in total to complete. There will be opportunities for breaks if you need.

Might anything about the research upset me?

Some of the questions ask about how you have been feeling recently, and sometimes this makes people feel good, or upset, depending on whether they can relate to the questions.

This is very normal so if you need to take a break at any point or want to stop then that is completely fine. We can talk about this or you might want to talk to your friends or a teacher or parent about it.

Will my information be kept private if I take part? Will anyone else know I'm doing this?

Everything you tell us as part of this project is treated as confidential; this means that nobody other than us will ever know what you have told us. You will be assigned a research ID number so no one will know who has filled out the questionnaires. Your answers will be kept in locked cabinets and nothing will have your name on it. Once we have finished the project the questionnaires will be destroyed.

We would not be able to keep information confidential if you tell us something which makes us worried about you or someone else, puts someone else at risk or we are worried about your safety. If this were to happen, we would pass on this information to a school staff member who can help you.

Did anyone else check the project is okay to do?

Before any research is allowed, it has to be checked by the University Ethics Committee. They make sure the research is safe and they are happy for the research to go ahead. Everyone working on this study has been through the formal Disclosure Barring Service (DBS) checks and has been approved by the Faculty of Medicine and Health Sciences at the University of East Anglia to work with young people.

What if I have more questions?

If you have any questions about our study, either now or later, please feel free to email us or phone to speak to us. You have a right to know everything and we will be happy to tell you everything. Also please feel free to talk about this study with your friends, parents and/or teachers.

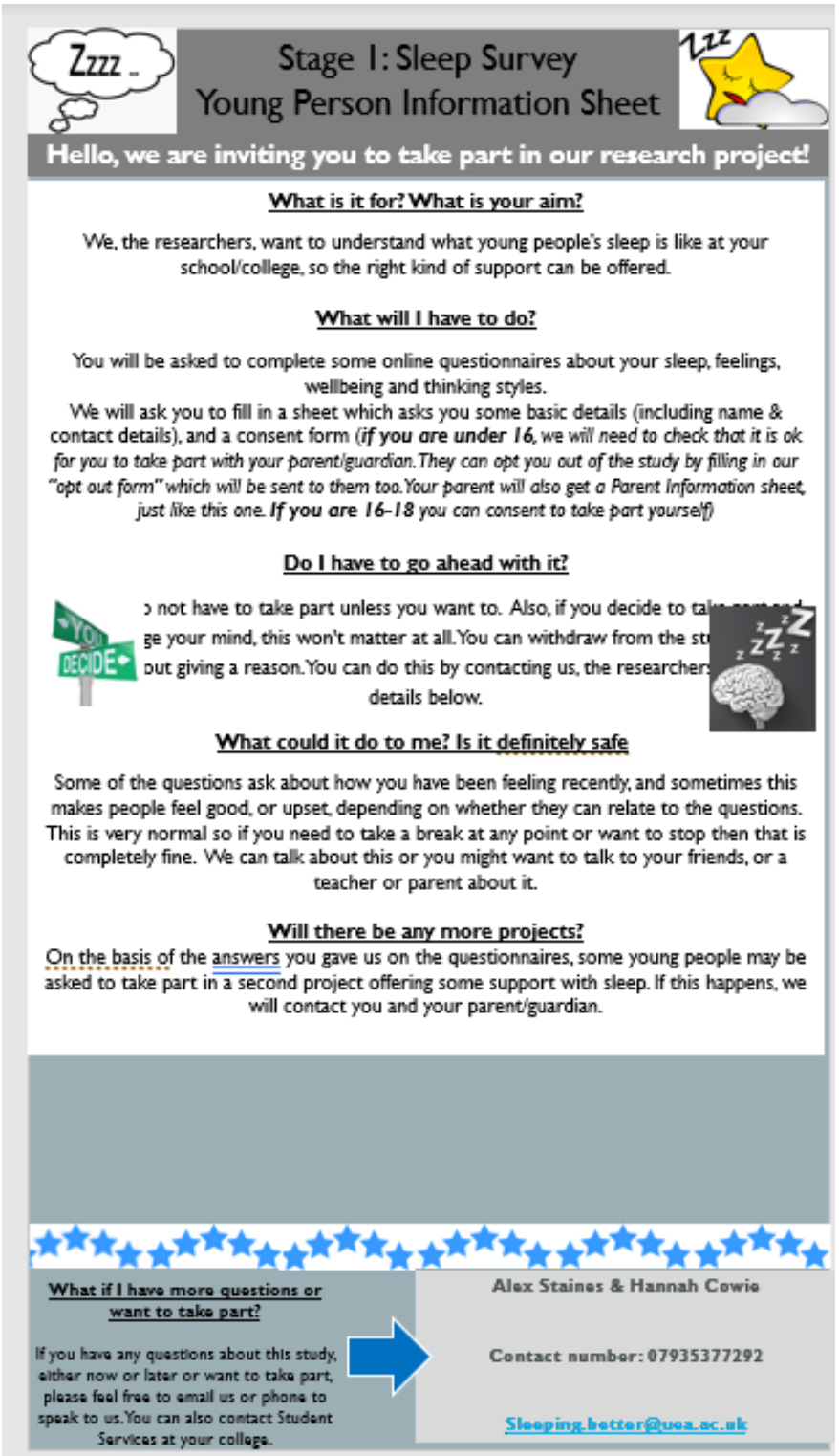
Will there be any more projects?

On the basis of your answers you gave us on the questionnaires, some young people may be asked to take part in a second project for some support with sleep. If this happens, we will contact you and your parent/guardian.

Thank you very much,

Alex Staines
a.staines@uea.ac.uk (insert research mobile number)
Hannah Cowie
h.cowie@uea.ac.uk (insert research mobile number)

Final Participant Information Sheets: Stage 1



Zzzz ..

Stage 1: Sleep Survey
Young Person Information Sheet

Hello, we are inviting you to take part in our research project!

What is it for? What is your aim?

We, the researchers, want to understand what young people's sleep is like at your school/college, so the right kind of support can be offered.

What will I have to do?

You will be asked to complete some online questionnaires about your sleep, feelings, wellbeing and thinking styles.
We will ask you to fill in a sheet which asks you some basic details (including name & contact details), and a consent form (*if you are under 16, we will need to check that it is ok for you to take part with your parent/guardian. They can opt you out of the study by filling in our "opt out form" which will be sent to them too. Your parent will also get a Parent information sheet, just like this one. If you are 16-18 you can consent to take part yourself)*

Do I have to go ahead with it?

YOU DECIDE

› not have to take part unless you want to. Also, if you decide to ta
ge your mind, this won't matter at all. You can withdraw from the st
out giving a reason. You can do this by contacting us, the researcher
details below.

What could it do to me? Is it definitely safe

Some of the questions ask about how you have been feeling recently, and sometimes this makes people feel good, or upset, depending on whether they can relate to the questions. This is very normal so if you need to take a break at any point or want to stop then that is completely fine. We can talk about this or you might want to talk to your friends, or a teacher or parent about it.

Will there be any more projects?

On the basis of the answers you gave us on the questionnaires, some young people may be asked to take part in a second project offering some support with sleep. If this happens, we will contact you and your parent/guardian.

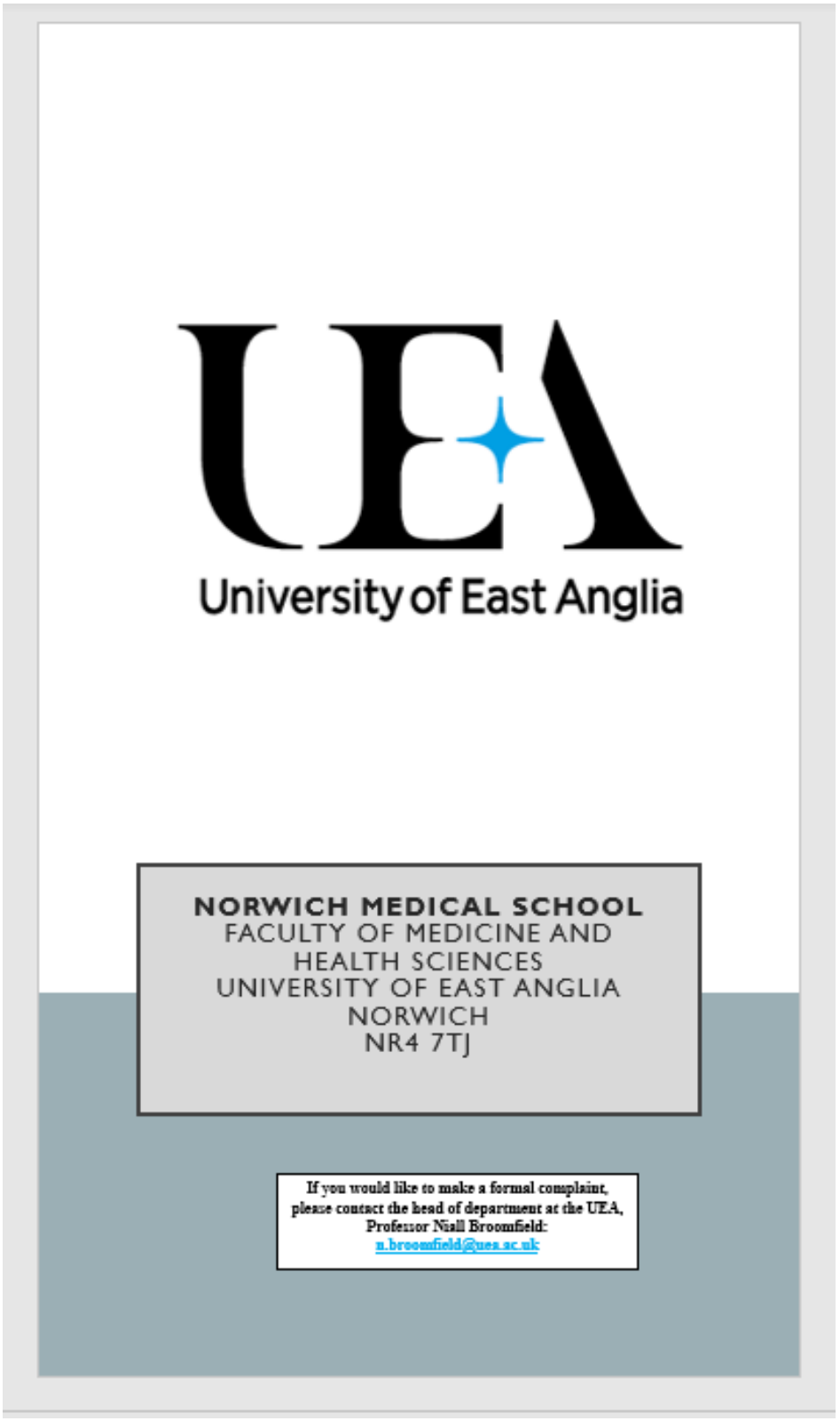
What if I have more questions or want to take part?

If you have any questions about this study, either now or later or want to take part, please feel free to email us or phone to speak to us. You can also contact Student Services at your college.

Alex Staines & Hannah Cowie

Contact number: 07935377292

Sleeping.better@uea.ac.uk


University of East Anglia
NORWICH MEDICAL SCHOOL
FACULTY OF MEDICINE AND
HEALTH SCIENCES
UNIVERSITY OF EAST ANGLIA
NORWICH
NR4 7TJ
If you would like to make a formal complaint, please contact the head of department at the UEA, Professor Niall Broomfield:
n.broomfield@uea.ac.uk

Appendix G. Demographics Questionnaire, Consent form & Sleep Survey

Faculty of Medicine and Health Sciences

Norwich Medical School
University of East Anglia
Norwich NR4 7TJ
United Kingdom

Email: sleeping.better@uea.ac.uk
Tel: 07935377292

Sleeping Better

Stage 1 Questionnaire Pack

Thank you for choosing to take part in our research project!

You should already have seen and read through the Participant Information Sheet, but if you would like another copy or to see this again before starting, let us know!

On the following pages you will be guided through a series of questionnaires.

This will include:

1) Written consent to take part
2) Some details about you
3) 5 questionnaires about your sleep, wellbeing and thinking styles
4) A sheet which gives you some helpful resources!

Faculty of Medicine and Health Science. Email:sleeping.better@uea.ac.uk
Tel: 07935377292 Web: www.uea.ac.uk

Norwich Medical School
University of East Anglia
Norwich NR4 7TJ
United Kingdom

University of East Anglia

Sleep Survey Consent Form for Young Persons

You should only say 'yes' to being in the study if you know what it is about and you want to be in it. If you don't want to be in the study, don't sign the form.

If your answer is YES to each question, please put your initials in each box:

Have you read (or had read to you) the information about this project?	
Has somebody explained this project to you?	
Do you understand what this project is about?	
Have you asked all the questions you want?	
Have you had your questions answered in a way you understand?	
Do you understand it's OK to stop taking part at any time?	
Are you happy to take part?	
Do you understand that the researchers won't tell anyone what you answer in the survey, unless you talk about being hurt by someone, or hurting yourself or someone else? If this happens, do you understand that we will notify your school so that they can offer you some support?	
Do you understand that if you're answers indicate that you may be struggling with your mental health that we will ask your school to provide you with some support, or suggest services that could help?	
If you are eligible, would you be happy for the researchers to contact you about a second study exploring the helpfulness of a sleep programme designed for young people?	

If you **do** want to take part, please write your name and today's date:

Your name: _____

Date:_____

Are you happy to be contacted about a future study? (This just means you will be asked, you do not have to take part!) YES / NO

If yes, please write your email address here:_____

Faculty of Medicine and Health Sciences

Norwich Medical School
University of East Anglia
Norwich NR4 7TJ
United Kingdom

University of East Anglia

Demographics Questionnaire

If you need help answering any of these questions, please discuss this with one of the researchers who will be happy to answer any questions that you might have.

Name:	
Date of Birth:	_____/_____/_____
Home Address:	
Mobile Number: *(We will use this to contact you if you are eligible to take part in the sleep study)*	
Email Address:	
School/college:	
Year Group:	
Gender:	
Please tick the box that best describes you:	**White British** ☐ **White Irish** ☐ **Any other White background** ☐ **White and Black Caribbean** ☐ **White and Black African** ☐ **White and Asian** ☐ **Any other mixed background** ☐ **Indian or Indian British** ☐ **Pakistani or Pakistani British** ☐ **Bangladeshi or Bangladeshi British** ☐ **Any other Asian background** ☐ **Caribbean or Caribbean British** ☐ **African or African British** ☐ **Any other Black background** ☐ **Chinese** ☐ **Any other ethnic group** ☐ **I don't want to say** ☐
Do you currently take any tablets or medication to help you sleep?	*Please circle:* **YES / NO** *(If yes, please specify which medications if you know the name):* _____
Are you currently having any help from another adult (such as a counsellor, school nurse or therapist) for your sleep, mental health or any other worries?	**YES / NO** *(If yes, please specify):* _____
Would you like some help to improve your sleep?	**YES / NO**
To take part in this study we also require your parent/carer's contact details	
Parent/carer/guardian's name(s):	
Parent/carer/guardian's contact number/email address:	

Pittsburgh Sleep Quality Index

The following questions relate to your usual sleep habits during the past month only. Please indicate the most accurate answer for the majority of days and nights in the past month.

Please note: When entering times: 12:00am = midnight; 12:00pm = midday

In the past month:

1. **When have you usually gone to bed at night? XX:XX AM/PM**
   *Write here:*_____

2. **How long has it usually taken you to fall asleep each night? Hours, minutes**
   *Write here:*_____

3. **When have you usually got out of bed in the morning? XX:XX AM/PM**
   *Write here:*_____

4. **In total, how many hours of actual sleep have you usually had each night? (This might be less than the number of hours you usually spend in bed.) Hours, minutes**
   *Write here:*_____

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 specify _____

☐ Not during the past month
☐ Less than once a week
☐ Once or twice a week
☐ Three or more times a week

6. During the past month, how would you rate your sleep quality overall?

☐ Very good
☐ Fairly good
☐ Fairly bad
☐ Very bad

7. During the past month, how often have you taken medicine/tablets to help you sleep?

☐ 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 often have you had trouble staying awake while at school, eating, or spending time with friends?

☐ Not during the past month
☐ Less than once a week
☐ Once or twice a week
☐ Three or more times a week

9. 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 of a problem
☐ A very big problem

Insomnia Severity Index

Please rate the severity of any sleep problem(s) you have had in the last two weeks:

a) Difficulty falling asleep at night

☐ None
☐ Mild
☐ Moderate
☐ Severe
☐ Very Severe

b) Difficulty staying asleep (this means waking up during the night after initially falling asleep)

☐ None
☐ Mild
☐ Moderate
☐ Severe
☐ Very Severe

c) Problems waking up too early (this means waking up earlier than you intended to and not getting back to sleep)

☐ None
☐ Mild
☐ Moderate
☐ Severe
☐ Very Severe

1. How SATISFIED/ DISSATISFIED are you with your CURRENT sleep pattern?

☐ Very satisfied
☐ Satisfied
☐ Moderately satisfied
☐ Dissatisfied
☐ Very Dissatisfied

2. How NOTICEABLE to others do you think your sleep problem is in terms of impairing the quality of your life?

☐ Not at all noticeable
☐ A little
☐ Somewhat
☐ Much
☐ Very much noticeable

3. How WORRIED/DISTRESSED are you about your current sleep problem?

☐ Not at all worried
☐ A little
☐ Somewhat
☐ Much
☐ Very much worried

4. To what extent do you consider your sleep problem to INTERFERE with your daily functioning (e.g. daytime sleepiness, mood, ability to function at school, daily chores, concentration, memory etc.) CURRENTLY?

☐ Not at all interfering
☐ A little
☐ Somewhat
☐ Much
☐ Very much interfering

The Short Warwick-Edinburgh Mental Well-being Scale

Below are some statements about feelings and thoughts. Please tick the box that best describes your experience of each over the last 2 weeks

1. **I've been feeling optimistic about the future**

☐ None of the time
☐ Rarely
☐ Some of the time
☐ Often
☐ All of the time

2. **I've been feeling useful**

☐ None of the time
☐ Rarely
☐ Some of the time
☐ Often
☐ All of the time

3. **I've been feeling relaxed**

☐ None of the time
☐ Rarely
☐ Some of the time
☐ Often
☐ All of the time

4. **I've been dealing with problems well**

☐ None of the time
☐ Rarely
☐ Some of the time
☐ Often
☐ All of the time

5. **I've been thinking clearly**

☐ None of the time
☐ Rarely
☐ Some of the time
☐ Often
☐ All of the time

6. **I've been feeling close to other people**

☐ None of the time
☐ Rarely
☐ Some of the time
☐ Often
☐ All of the time

7. **I've been able to make up my own mind about things**

☐ None of the time
☐ Rarely
☐ Some of the time
☐ Often
☐ All of the time

Dysfunctional Beliefs and Attitudes about Sleep Questionnaire for Children and adolescents

Sentences about some people's beliefs and attitudes about sleep are listed below. Please show me how much you agree or disagree with each sentence. There is no right or wrong answer. For each sentence, circle the number to show what you think.

1 = Strongly disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly agree

1. **I must always have at least 9 hours sleep to function well or do well during the day.**

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Neutral
☐ (4) Agree
☐ (5) Strongly agree

2. **When I don't get the sleep I need on a particular night, I must catch up the next day by napping or by sleeping longer the next night.**

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Neutral
☐ (4) Agree
☐ (5) Strongly agree

3. **I am really worried that difficulty falling or staying asleep over a long period of time, might affect my physical appearance.**

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Neutral
☐ (4) Agree
☐ (5) Strongly agree

4. **When I have trouble getting to sleep, I should stay in bed and try harder.**

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Neutral
☐ (4) Agree
☐ (5) Strongly agree

5. **When I have trouble getting to sleep, it makes me worry that I may stop being able to sleep.**

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Neutral
☐ (4) Agree
☐ (5) Strongly agree

6. **When I don't get the sleep I need, I know that it will really affect the things that I do the next day.**

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Neutral
☐ (4) Agree
☐ (5) Strongly agree

7. **When I feel annoyed, sad, or worried during the day, it is always because I didn't get the sleep I needed the night before.**

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Neutral
☐ (4) Agree
☐ (5) Strongly agree

8. **When I don't get the sleep I need on one night, I know it will disturb the way I sleep for the whole week.**

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Neutral
☐ (4) Agree
☐ (5) Strongly agree

9. **When I feel tired, have no energy, or just seem to do badly during the day, it is always because I didn't get the sleep I needed the night before.**

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Neutral
☐ (4) Agree
☐ (5) Strongly agree

10. **When I have lots of thoughts at night, I usually feel that I cannot control all these thoughts that I am having.**

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Neutral
☐ (4) Agree
☐ (5) Strongly agree

The Revised Child Anxiety and Depression Scale

Please tick the box next to the word that shows how often each of these things happens to you.
There are no right or wrong answers.

1. **I worry about things**

☐ Never
☐ Sometimes
☐ Often
☐ Always

2. **I feel sad or empty**

☐ Never
☐ Sometimes
☐ Often
☐ Always

3. **When I have a problem, I get a funny feeling in my stomach**

☐ Never
☐ Sometimes
☐ Often
☐ Always

4. **I worry when I think I have done poorly at something**

☐ Never
☐ Sometimes
☐ Often
☐ Always

5. **I would feel afraid of being on my own at home**

☐ Never
☐ Sometimes
☐ Often
☐ Always

6. **Nothing is much fun anymore**

☐ Never
☐ Sometimes
☐ Often
☐ Always

7. **I feel scared when I have to take a test**

☐ Never
☐ Sometimes
☐ Often
☐ Always

8. **I feel worried when I think someone is angry with me**

☐ Never
☐ Sometimes
☐ Often
☐ Always

9. **I worry about being away from my parent**

☐ Never
☐ Sometimes
☐ Often
☐ Always

10. **I am bothered by bad or silly thoughts or pictures in my mind**

☐ Never
☐ Sometimes
☐ Often
☐ Always

11. **I have trouble sleeping**

☐ Never
☐ Sometimes
☐ Often
☐ Always

12. **I worry that I will do badly at my school work**

☐ Never
☐ Sometimes
☐ Often

☐ Always

13. I worry that something awful will happen to someone in my family

☐ Never
☐ Sometimes
☐ Often
☐ Always

14. I suddenly feel as if I can't breathe when there is no reason for this

☐ Never
☐ Sometimes
☐ Often
☐ Always

15. I have problems with my appetite

☐ Never
☐ Sometimes
☐ Often
☐ Always

16. I have to keep checking that I have done things right (like the switch is off, or the door is locked)

☐ Never
☐ Sometimes
☐ Often
☐ Always

17. I feel scared if I have to sleep on my own

☐ Never
☐ Sometimes
☐ Often
☐ Always

18. I have trouble going to school in the mornings because I feel nervous or afraid

☐ Never
☐ Sometimes
☐ Often
☐ Always

19. I have no energy for things

☐ Never
☐ Sometimes
☐ Often
☐ Always

20. I worry I might look foolish

☐ Never
☐ Sometimes
☐ Often
☐ Always

21. I am tired a lot

☐ Never
☐ Sometimes
☐ Often
☐ Always

22. I worry that bad things will happen to me

☐ Never
☐ Sometimes
☐ Often
☐ Always

23. I can't seem to get bad or silly thoughts out of my head

☐ Never
☐ Sometimes
☐ Often
☐ Always

24. When I have a problem, my heart beats really fast

☐ Never
☐ Sometimes
☐ Often
☐ Always

25. I cannot think clearly

☐ Never
☐ Sometimes
☐ Often
☐ Always

26. I suddenly start to tremble or shake when there is no reason for this

☐ Never
☐ Sometimes
☐ Often
☐ Always

27. I worry that something bad will happen to me

☐ Never
☐ Sometimes
☐ Often
☐ Always

28. When I have a problem, I feel shaky

☐ Never
☐ Sometimes
☐ Often
☐ Always

29. I feel worthless

☐ Never
☐ Sometimes
☐ Often
☐ Always

30. I worry about making mistakes

☐ Never
☐ Sometimes
☐ Often
☐ Always

31. I have to think of special thoughts (like numbers or words) to stop bad things from happening

☐ Never
☐ Sometimes
☐ Often
☐ Always

32. I worry what other people think of me

☐ Never
☐ Sometimes
☐ Often
☐ Always

33. I am afraid of being in crowded places (like shopping centres, the movies, buses, busy playgrounds)

☐ Never
☐ Sometimes
☐ Often
☐ Always

34. All of a sudden I feel really scared for no reason at all

☐ Never
☐ Sometimes
☐ Often
☐ Always

35. I worry about what is going to happen

☐ Never
☐ Sometimes
☐ Often
☐ Always

36. I suddenly become dizzy or faint when there is no reason for this

☐ Never
☐ Sometimes
☐ Often
☐ Always

37. I think about death

☐ Never

☐ Sometimes
☐ Often
☐ Always

38. I feel afraid if I have to talk in front of my class

☐ Never
☐ Sometimes
☐ Often
☐ Always

39. My heart suddenly starts to beat too quickly for no reason

☐ Never
☐ Sometimes
☐ Often
☐ Always

40. I feel like I don't want to move

☐ Never
☐ Sometimes
☐ Often
☐ Always

41. I worry that I will suddenly get a scared feeling when there is nothing to be afraid of

☐ Never
☐ Sometimes
☐ Often
☐ Always

42. I have to do some things over and over again (like washing my hands, cleaning or putting things in a certain order)

☐ Never
☐ Sometimes
☐ Often
☐ Always

43. I feel afraid that I will make a fool of myself in front of people

☐ Never
☐ Sometimes
☐ Often
☐ Always

44. I have to do some things just in the right way to stop bad things from happening

☐ Never
☐ Sometimes
☐ Often
☐ Always

45. I worry when I go to bed at night

☐ Never
☐ Sometimes

☐ Often
☐ Always

46. I would feel scared if I had to stay away from home overnight

☐ Never
☐ Sometimes
☐ Often
☐ Always

47. I feel restless

☐ Never
☐ Sometimes
☐ Often
☐ Always

Sleep Anticipatory Anxiety Questionnaire - Adolescent Version

Circle the one phrase for each item that best represents the extent to which you agree with the item.

Strongly Disagree (1)
Disagree (2)
Agree (3)
Strongly Agree (4)

When I try to fall asleep at night:

1. My muscles are tense
☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

2. My heart is beating rapidly
☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

3. I feel "shaky"/trembling
☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

4. I become short of breath
☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

5. I become aware of my body (feeling itches, sweat, pain, nausea)

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

6. I can't stop my mind racing

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

7. I worry that I won't be able to fall asleep

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

8. I worry that I won't get enough sleep

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

9. I worry that I won't be able to function the next day if I don't sleep

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

10. I worry that I will be tired and irritable the next day if I don't sleep

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

11. I worry about my school work

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

12. I can't stop thinking about what I have to do tomorrow

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

13. I can't stop thinking about what happened during the day

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

14. I worry about my relationship (e.g., with my boyfriend/girlfriend/parents)

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

15. I worry about my friendships

☐ (1) Strongly disagree
☐ (2) Disagree
☐ (3) Agree
☐ (4) Strongly agree

Glasgow Sleep Effort Scale

The following seven statements relate to your night-time sleep pattern in the past week. Please indicate by circling one response how true each statement is for you.

Very much (1)
To some extent (2)
Not at all (3)

1. I put too much effort into sleeping when it should come naturally

☐ (1) Very much
☐ (2) To some extent
☐ (3) Not at all

2. I feel I should be able to control my sleep

☐ (1) Very much
☐ (2) To some extent
☐ (3) Not at all

3. I put off going to bed at night for fear of not being able to sleep

☐ (1) Very much
☐ (2) To some extent
☐ (3) Not at all

4. I worry about not sleeping if I cannot sleep

☐ (1) Very much
☐ (2) To some extent
☐ (3) Not at all

5. I am no good at sleeping

☐ (1) Very much
☐ (2) To some extent
☐ (3) Not at all

6. I get anxious about sleeping before I go to bed

☐ (1) Very much
☐ (2) To some extent

☐ (3) Not at all

7. I worry about the consequences of not sleeping

☐ (1) Very much
☐ (2) To some extent
☐ (3) Not at all

You have now finished the questionnaires!

Please see the next two pages for some helpful resources for you to keep!

Please hand your completed questionnaires back to the researchers.

We thank you for your time!

Appendix H. Stage 1 - Parents Information Sheet & Opt-Out Form

Norwich Medical School
Faculty of Medicine and Health Sciences
University of East Anglia
Norwich
NR4 7TJ
Email: H.Cowie@uea.ac.uk
A.staines@uea.ac.uk
Tel: +44 (0) 1603 59xxxx
Web: www.uea.ac.uk

University of East Anglia

Stage 1: Sleep Survey
Parents Information Sheet

What is the purpose of the study?

We want to find out more about the sleep quality and quantity of students at your child's school, to help us develop the right support strategies for young people.

Why are we inviting your son/daughter to take part?

We are currently undertaking a Clinical Psychology Doctorate at the University of East Anglia and are employed by the NHS. Your son/daughter has been invited to take part because their school has agreed to be part of this research project. They have not been individually selected.

Does my child have to take part?

No, the study is completely voluntary for students to take part.

11-15 year olds

This is an opt-out study. This means that if your child is under 16 and you **DO NOT** want them to take part, please sign and return the attached 'opt-out' form. If you do not return this form (or tell the school in another way) we will assume that you are happy for your child to take part in this research. Your child will also be asked if they are happy to take part and are free to opt out themselves. Either you or your child can withdraw your child from the study at any time without giving a reason.

16 years and above

If your child is aged 16 or over, they do not need parental consent. They will be asked if they are happy to take part and they are free to opt-out themselves. If they agree to take part, they are still free to withdraw at any time without giving a reason.

What will happen if my child takes part?

Your son/daughter will complete some short questionnaires and give their written consent during an hour slot in the school day, at a time agreed with the school (e.g. at tutor time). The questions will ask about sleep, feelings, wellbeing and thinking styles.

What are the possible disadvantages and risks of taking part?

We do not expect there to be any disadvantages or risks involved in taking part in this research. Some of the questions ask about feelings, and it is possible that some adolescents may find this upsetting if they are having particular emotional difficulties.

If anyone became upset by any of the questions, we would offer to stop the research immediately (and your child can choose not to answer questions if they wish). During the research we will follow all school safeguarding and child protection policies. Additionally, all students will be given a support sheet to keep. The list contains helpful resources for those who want to learn more about sleep and where to seek advice

As the research will be carried out in school, we do not require you or your child to come to the University at any point. The study will be carried out in whole classes/tutor groups so your child will not miss any teaching.

What are the possible benefits?

Taking part will help us gain a greater understanding of the sleep quality and quantity of students at your child's school. We hope to use this information to consider what interventions may be most suitable and could be offered in the school setting.

What if there is a problem?

If you have any concern about any aspect of the study, you should ask to speak to the main researchers of the study, Hannah Cowie or Alex Staines (see contact details below). If you remain unhappy and wish to complain formally, you can contact your child's Headteacher or Deputy Head.

Will our taking part in the study be kept confidential?

All the information provided will be kept confidential. The information we collect (questionnaire answers) will not have any names on and will be kept in locked cabinets in locked offices at the University. Consent forms with names on will be kept in a separate locked cabinet. All the information collected for the project will be destroyed as soon as they are no longer needed. The consent forms will be kept for 5 years before disposal.

The only exception to this is if your child tells us something which puts them, or someone else, at risk. If this happens, we will inform the school who will follow their risk and safeguarding policies. We are asking students about their sleep and feelings, and if we feel any student is at risk of harm, we will alert a nominated member of the school staff who will then follow school procedures.

What will happen to the results of the research study?

We hope to write these results up for publication in a scientific journal. No personal information will be given, and any material used will be anonymous and not be traceable to a particular person. If you would like a report of the findings of our study, we will be happy to provide it. Please note that the publication may take a year or more after the completion of the study.

Who has reviewed the study?

All research at the University of East Anglia is reviewed by an independent group of people, called a Research Ethics Committee, to protect your interests. This application has been reviewed and given a favourable opinion by the University of East Anglia Research Ethics Committee. Everyone working on this study has been through the formal Criminal Records Bureau Disclosure (DBS) process and has been approved by the

Faculty of Medicine and Health Sciences at the University of East Anglia to work with young people.

Does my child have to take part?

No: Participation in this research is entirely voluntary. If you or your child has any questions, please do not hesitate to contact us by phone or email. We will be happy to tell you more about the research and to discuss any questions or concerns you might have.

Will there be any further studies?

On the basis of your child's answers on the questionnaires, some young people may be eligible for a second project for some support with sleep. We would send you information about this separately, so in this study we are just asking students to let us know if they are happy to be contacted in future- they are not signing up to anything else.

Alex Staines
a.staines@uea.ac.uk (insert research mobile number)
Hannah Cowie
h.cowie@uea.ac.uk (insert research mobile number)

Norwich Medical School
Faculty of Medicine and Health Sciences
University of East Anglia
Norwich
NR4 7TJ
Email: H.Cowie@uea.ac.uk
A.staines@uea.ac.uk
Tel: +44 (0) 1603 59xxxx
Web: www.uea.ac.uk

OPT-OUT FORM

Title of study: Piloting a brief sleep intervention for adolescents in the community (Stage 1: Sleep Survey)

Please only complete and return this form if you DO NOT want your child to take part in this research.

I **do not** agree to my child participating in this research.

Your child's name: _____
Your child's tutor group (if known): _____

Your Name: _____

Signature:_____
Date: _____

Study leads:

Alex Staines
a.staines@uea.ac.uk
(insert research mobile number)

Hannah Cowie
h.cowie@uea.ac.uk
(insert research mobile number)

Appendix I: Stage 2. Participant Information Sheets and Consent Forms (Young Person & Parent)

Norwich Medical School
Faculty of Medicine and Health Sciences
University of East Anglia
Norwich
NR4 7TJ
Email: H.Cowie@uea.ac.uk
A.staines@uea.ac.uk
Tel: +44 (0) 1603 59xxxx
Web: www.uea.ac.uk

Sleeping Better Programme: Young Person Information Sheet

Hello, we are inviting you to take part in a study we are doing!

Why is this study being done?

Many students and young people can have difficulties with sleeping, and this can affect how they are doing at school and in general day-to-day life. The aims of this study are to find out:

1) Is it possible to offer a sleep programme to help improve sleep? and
2) Does taking part in the programme help students?

Who can take part?

The study is available to some students at your school who have taken part in Stage 1 of our study. If you told us you want some help with your sleep and your questionnaires showed us you have some troubles with your sleep, you are able to take part.

What do I gain if I take part?

If you agree to take part, you will learn strategies and be given information to help manage your sleep habits. The programme can either be done at school or in your home – this is your choice, so whatever works best for you.

Do I have to go ahead with it? Do I have a choice?

No: Whether or not you take part is **completely up to you** and your parent/guardian. If you do want to take part, we will need to check with your parent/guardian that they are ok for you to take part too. We will also need their contact details if you want to take part.

If you decide to take part and then you or your parent/guardian change your mind, that is completely fine, you can leave the study at any time and do not have to give us a reason for this.

Will joining in help me?

We think so. You will be getting some practical information about how to manage your bedtime routine and improve your sleep habits. We think this will help you now and in the future.

What will happen if I take part in the study?

Step 1

First, we will meet you and your parent/guardian if possible (or we can speak to them over the phone), for around an hour to give you a chance to ask any questions, so that you can decide if you would like to take part. We will ask you and your parent to complete a form to say you are happy to take part. We will then ask you to fill out some questionnaires. These will about sleep, feelings, wellbeing and thinking styles.

Step 2

We would then meet you for five weekly 1:1 appointment (both face-to-face and over the phone) with you and a parent/guardian if possible (a total time of 5 hours). You will learn some tips and ideas which may help improve your sleep.

Will we have the same researcher from start to finish?
Yes.

Is it safe to take part?

Some teenagers might get upset if they think about their feelings, but we will be able to help if this happens. If you wish to talk about any problems, then please let us know and we will follow this up.

Will my information be kept private if I take part?
We will tell your school that you are taking part in the study, and your parents so they also know it is happening.

Everything you tell us as part of this study is treated as confidential. This means that nobody other than us will ever know what you have told us. The only time we would not be able to keep something to ourselves is if you told us that you or someone else was at risk of harm. In this situation we would have to speak to another adult, like the person who looks after you or someone at school.

We will give you an ID number and use this on all the information you give us in the study, rather than your name. All your study information will be kept in locked cabinets and briefcases. Once we have finished the project all the questionnaires will be shredded, and computer files will be deleted. Consent forms will be kept for 5 years and then destroyed.

Did anyone else check the study is okay to do?
Before any research is allowed to happen, it has to be checked by a group of people called an Ethics Committee. They make sure the research is okay to do. Everyone working on this study have had

criminal record checks and have been approved to work with children and young people.

What if there is a problem?
If you have any worries about any part of this study then please contact one of the researchers, Alex Staines or Hannah Cowie (contact details below). Your parent/carers can speak with us too. You can also speak to someone at your school.

What if I have more questions?
If you have any questions about our project, either now or later, please feel free to email us or phone to speak to us. We will be happy to tell you anything you want to know.

Thanks!

Researchers:

Alex Staines
a.staines@uea.ac.uk
(insert research mobile number)

Hannah Cowie
h.cowie@uea.ac.uk
(insert research mobile number)

Final Participant Information Sheet – Stage 2

Stage 2: Sleeping Better Young Person Information Sheet

Hello, we are inviting you to take part in our research project!

What is it for? What is your aim?

Many students and young people can have difficulties with sleeping, and this can affect how they are doing at school and in general day-to-day life. The aims of this study are to find out:
1) Is it possible to offer a sleep programme to help improve sleep?
2) Does taking part in the programme help students?

What will I have to do?

Step 1

First, we, the researchers, will meet you, the participant, and your parent/guardian if possible (or we can speak to them over the phone), for around an hour to give you both a chance to ask any questions, so that you can decide if you would like to take part. We will ask you and your parent to complete a form to say you are happy to take part. We will then need you to fill out some questionnaires. These will be about sleep, feelings, wellbeing and thinking styles.

Step 2

We would then meet you for five weekly 1:1 appointments (both face-to-face and over the phone) with you and a parent/guardian if possible (a total of 5 hours of your time with researchers). You will learn some tips and ideas which may help improve your sleep.

Will I have the same researcher from start to finish?

Yes.

What do I gain if I take part?

If you agree to take part, you will learn skills and be given information to help manage your sleep habits. The programme can either be done at school or in your home – this is your choice, so whatever works best for you.

Do I have to go ahead with it?

No: Whether or not you take part is **completely up to you** and your parent/guardian. If you do want to take part, we will need to check with your parent/guardian that they are ok for you to take part too. We will also need their contact details if you want to take part.

If you decide to take part and then you or your parent/guardian change your mind, that is completely fine, you can leave the study at any time and do not have to give us a reason for this. If you complete the programme, you will only be able to withdraw your data up until the point it has been made anonymous.

What could it do to me? Is it definitely safe?

Some teenagers might get upset if they think about their feelings, but we will be able to help if this happens. If you wish to talk about any problems, then please let us know and we will follow this up.

What if there is a problem?

If you have any worries about any part of this study then please contact one of the researchers, Alex Staines or Hannah Cowie (contact details below). Your parent/carers can speak with us too. You can also speak to the pastoral team at your school.

What if I have more questions?

If you have any questions about our study, either now or later, please feel free to email us or phone to speak to us. You can also speak to your pastoral team at the school.

Alex Staines & Hannah Cowie

(insert mobile numbers)

Sleeping.better@uea.ac.uk

NORWICH MEDICAL SCHOOL
FACULTY OF MEDICINE AND
HEALTH SCIENCES
UNIVERSITY OF EAST ANGLIA
NORWICH
NR4 7TJ

If you would like to make a formal complaint, please contact the head of department at the UEA, Professor Niall Broomfield:
n.broomfield@uea.ac.uk

Norwich Medical School
Faculty of Medicine and Health Sciences
University of East Anglia
Norwich
NR4 7TJ
Email: H.Cowie@uea.ac.uk
A.staines@uea.ac.uk
Tel: +44 (0) 1603 59xxxx
Web: www.uea.ac.uk

Sleeping Better Programme: Parent Information Sheet

Title of study: Piloting a brief sleep intervention for adolescents in the community

What is the purpose of the study?

Many students and young people can have difficulties with sleep, and this can affect how they are doing at school and in general day-to-day life. It can be difficult for young people to access support for emotional difficulties for a variety of reasons including stigma and not knowing where to seek help. The purpose of this research is to assess the feasibility of delivering low-intensity, brief sleep interventions in schools to students who have difficulties with sleep.

Why are we inviting your son/daughter to take part?

We are currently undertaking a Clinical Psychology Doctorate at the University of East Anglia and are employed by the NHS. Your son/daughter has been invited to take part because after they completed Stage 1 of our initial project (Sleep Survey), it indicated they would like some help with their sleep, and the questionnaires they completed suggest they have some troubles with their sleep.

Does my child have to take part?

No, the study is completely voluntary for students to take part.

What will happen if my child takes part?

Step 1

First, we will arrange a time to meet your child and yourself if possible (or we can speak to you over the phone) to give you both a chance to ask any questions, so that you can both decide if you would like to take part. We will ask you and your child to complete a form to say you are happy to take part. We will then ask your child to fill out some questionnaires. These will about sleep, feelings, wellbeing and thinking styles. This will take around an hour.

Step 2

We would then meet your child, with yourself if possible, for five weekly 1:1 appointment (both face-to-face and over the phone - a total time of 5 hours). Your child will learn some tips and ideas which may help improve their sleep.

Where will the study be conducted?

The study can be conducted either in school, or in your home. This can be decided collaboratively with you and your child, and the researchers can be flexible to arrange sessions that suit you both.

Will participants be asked for information on particularly sensitive issues?

No. However, some young people might get upset if they think about their feelings, but the research leader will be able to help if this happens. If you wish to talk about your individual concerns, then please let the research leader know and a member of our team will follow this up. The school will also be aware that your child is taking part in the study, and any concerns can be discussed with them also.

Will our taking part in the study be kept confidential?

All the information provided will be kept confidential. The information we collect (questionnaire answers) will not have any names on (unique ID numbers will be used) and will be kept in locked cabinets in locked offices at the University. Consent forms with names on will be kept in a separate locked cabinet. All the information collected for the project will be destroyed as soon as they are no longer needed. The consent forms will be kept for 5 years before disposal. Participants can have access to their data at any time.

Anything you or your child discusses with us is kept entirely confidential. The only exception to this is if your child tells us something which puts them, or someone else, at risk of harm. If this happens, we will inform the school who will follow their risk and safeguarding policies. We are asking students about their sleep and other areas of their emotional health, and if we feel any student is at risk of harm, we will alert a nominated member of the school staff team who will then follow school procedures.

What are the possible benefits of taking part?

Your child will learn some useful strategies to help with their sleep. As researchers, we hope to learn more about what young people find helpful in a sleep intervention so we can improve our interventions.

What are the possible disadvantages and risks of taking part?

We do not expect there to be any disadvantages or risks involved in taking part in this research. Some of the questions ask about feelings, and it is possible that some adolescents may find this upsetting if they have particular emotional difficulties.

If anyone was upset by any of the questions initially or at any stage of the intervention, we would offer to stop the research immediately (and your child can choose not to answer questions if they wish). During the research we will follow all school safeguarding and child protection policies. Additionally, all students will be given a support sheet to keep. The list contains helpful resources for those who want to learn more about sleep or other related difficulties or would like to seek advice.

What if there is a problem?

If you have any worries about any aspect of this study then please contact one of the lead researchers, Alex Staines or Hannah Cowie (contact details below). You can also speak to the deputy head or the pastoral team at the school.

What will happen to the results of the research study?

We hope to write these results up for publication in a scientific journal. No personal information will be given, and any material used will be anonymous and not be traceable to a particular person. If you would like a report of the findings of our study, we will be happy to provide it. Please note that the publication may take a year or more after the completion of the study.

Who has reviewed the study?

All research at the University of East Anglia is reviewed by an independent group of people, called a Research Ethics Committee, to protect your interests. Everyone working on this study has been through the formal Criminal Records Bureau Disclosure (DBS) process and has been approved by the Faculty of Medicine and Health Sciences at the University of East Anglia to work with young people.

What will happen if my child or I do not want to carry on with the study?

Your child can withdraw at any point throughout the study, without providing a reason. Whether or not your child takes part is **completely up to them and you**. If you decide to take part and then change your mind, that is completely fine.

What if I have more questions?

If you have any questions about our project, either now or later, please feel free to email us or phone to speak to us. We will be happy to tell you anything you want to know.

What happens when the research study stops?

Your child will be given a workbook which they can use during and after the study stops. They will also be provided with a list of online resources which they can access after the study stops. After the study, should there be any further concerns, you can contact the researchers involved in the study.

Thanks!

Study leads:

Alex Staines
a.staines@uea.ac.uk
(insert research mobile number)

Hannah Cowie
h.cowie@uea.ac.uk
(insert research mobile number)

Norwich Medical School
Faculty of Medicine and Health Sciences
University of East Anglia
Norwich
NR4 7TJ
Email: H.Cowie@uea.ac.uk
A.staines@uea.ac.uk
Tel: +44 (0) 1603 59xxxx
Web: www.uea.ac.uk

University of East Anglia

The Sleeping Better Programme Adolescent Consent Form

If your answer is YES to each question, please put your initials in each box:

Have you read (or had read to you) the information about this project?	
Has somebody explained this project to you?	
Do you understand what this project is about?	
Have you asked all the questions you want?	
Have you had your questions answered in a way you understand?	
Do you understand it is okay to stop taking part at any time?	
Are you happy to take part?	
Do you understand that the researchers won't tell anyone what you say in sessions, unless you talk about being hurt by someone or hurting yourself or someone else?	
Do you understand that if you do talk about being hurt by someone, hurting yourself or hurting someone else then the researchers will share that information with your parent/carer or with the school to help keep you safe?	

If any answer are 'no' or you **don't** want to take part, then don't sign!
If you **do** want to take part, please write your name and today's date:

Your name: _____ Date: _____

Do you want us to tell you what we learnt in the study? YES/ NO

The person who explained this project to you needs to sign too:

Researcher name: _____ Date: _____

Sign: _____

Norwich Medical School
Faculty of Medicine and Health Sciences
University of East Anglia
Norwich
NR4 7TJ
Email: H.Cowie@uea.ac.uk
A.staines@uea.ac.uk
Tel: +44 (0) 1603 59xxxx
Web: www.uea.ac.uk

The Sleeping Better Programme: Piloting a brief sleep intervention for adolescents in the community
PARENT/CARER CONSENT FORM

I, ... [PRINT PARENT'S/CARER'S NAME], consent to my child ……[PRINT CHILD'S NAME] participating in this research study.

In giving my consent I state that:
✓ I understand the purpose of the study, what my child will be asked to do, and any risks/benefits involved.
✓ I have read the Information Sheet and have been able to discuss my child's involvement in the study with the researchers if I wished to do so.
✓ The researchers have answered any questions that I had about the study and I am happy with the answers.
✓ I understand that being in this study is completely voluntary and my child does not have to take part. My decision whether to let them take part in the study will not affect our relationship with the researchers or anyone else at the University of East Anglia, Cambridge and Peterborough NHS Foundation trust or my child's school, now or in the future.
✓ I understand that my child can withdraw from the study at any time.
✓ I understand that my child may leave the face to face or telephone intervention sessions at any time.
✓ I understand that my child is completing questionnaires throughout this study and that this data will be anonymised once entered electronically.
✓ I understand that personal information about my child that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to. I understand that information about my child will only be told to others with my permission, except as required by law.
✓ I understand that the results of this study may be published, and that publications will not contain my child's name or any identifiable information about my child.

Would you like to receive feedback about the overall results of this study?
YES. ☐ NO. ☐

Name: _____ Date: _____

Sign: _____

Appendix J. Stage 2 Session by Session Measures & Feedback Forms

Sleep Diary

Consensus Sleep Diary (Carney et al., 2012)

1. What time did you get into bed?
2. What time did you try to go to sleep?
3. How long did it take you to fall asleep?
4. How many times did you wake up, not counting your final awakening?
5. In total, how long did these awakenings last?
6. What time was your final awakening?
7. What time did you get out of bed for the day?
8. How would you rate the quality of your sleep? □ Very poor □ Poor □ Fair □ Good □ Very good

Child Outcome Rating Scale

How are you doing? How are things going in your life? Please make a mark on the scale to let us know. The closer to the smiley face, the better things are. The closer to the frowny face, things are not so good. *If you are a caretaker filling out this form, please fill out according to how you think the child is doing.*

Me
(How am I doing?)

I----------I


Family
(How are things in my family?)

I----------I


School
(How am I doing at school?)

I----------I


Everything
(How is everything going?)

I----------


Outcome Rating Scale

Looking back over the last week, including today, help us understand how you have been feeling by rating how well you have been doing in the following areas of your life, where marks to the left represent low levels and marks to the right indicate high levels. *If you are filling out this form for another person, please fill out according to how you think he or she is doing.*

Individually
(Personal well-being)

I----------I

Interpersonally
(Family, close relationships)

I----------I

Socially
(Work, school, friendships)

I----------I

Overall
(General sense of well-being)

I----------I

Sleeping Better Programme: Young Person Feedback Form

It would be great if you could fill in the questionnaire below to give us some feedback which will help us improve our interventions. It should only take around 5 minutes to complete. Thank you.

University of East Anglia

Name:_____

Please circle the response that best fits how you feel:

1) **Did you like the Sleeping Better Programme?**

Really liked it Liked it It was OK Disliked it Hated it

2) **Did you find the Sleeping Better Programme useful?**

Very useful Fairly useful OK but could be improved Not very useful Not at all useful

3) **How motivated were you to complete the Sleeping Better Programme?**

Very motivated Motivated Neutral Unmotivated Very unmotivated

4) **Would you recommend the Sleeping Better Programme to a friend?**

Yes definitely Probably Not sure Probably not Definitely not

5) **How easy was it to have treatment sessions over the phone?**

Very easy Easy OK (some difficulties) Difficult Very difficult (it didn't work at all)

6) **How useful were the materials (e.g. workbook, leaflets) given to you during the Sleeping Better Programme?**

Very useful Fairly useful OK but could be improved Not very useful Not at all useful

7) **How would you describe the relationship with the therapist throughout treatment?**

Very good Good OK Poor Very poor

If you have any further comments about your relationship with the therapist please write them below:

……

……

……

……

8) What did you like best about the Sleeping Better Programme?

……

……

……

……

9) What did you like least about the Sleeping Better Programme?

……

……

……

……

10) Was there anything you struggled with during the Sleeping Better Programme?

……

……

……

……

11) How would you improve the Sleeping Better Programme (e.g. number of treatment sessions, the work booklet etc.):

……

……

……

……

Any other comments:

……

……

……

……

☺ Thanks for your time ☺

Sleeping Better Programme: Parent Feedback Form

It would be great if you could fill in the questionnaire below to give us some feedback which will help us improve our interventions. It should only take around 5 minutes to complete. Thank you.

Name:_____

Please circle the response that best fits how you feel:

1) **Did you like the Sleeping Better Programme?**

Really liked it Liked it It was OK Disliked it Hated it

2) **Did you find the Sleeping Better Programme useful for your child?**

Very useful Fairly useful OK but could be improved Not very useful Not at all useful

3) **Would you recommend the Sleeping Better Programme to someone else?**

Yes definitely Probably Not sure Probably not Definitely not

4) **How easy was it to have treatment sessions over the phone?**

Very easy Easy OK (some difficulties) Difficult Very difficult (it didn't work at all)

5) **How easy was it to support your child during the Sleeping Better Programme?**

Very easy Easy OK (some difficulties) Difficult Very difficult

6) **How useful were the materials (e.g. workbook, leaflets) given to you and your child during the Sleeping Better Programme?**

Very useful Fairly useful OK but could be improved Not very useful Not at all useful

7) **How would you describe the relationship with the therapist throughout treatment?**

Very good Good OK Poor Very poor

If you have any further comments about your relationship with the therapist please write them below:

……

……

……

……

8) What did you like best about the Sleeping Better Programme?

……

……

……

……

9) What did you like least about the Sleeping Better Programme?

……

……

……

……

10) Was there anything you struggled with during the Sleeping Better Programme?

……

……

……

……

11) How would you improve the Sleeping Better Programme (e.g. number of treatment sessions, the work booklet etc.):

……

……

……

……

Any other comments:

……

……

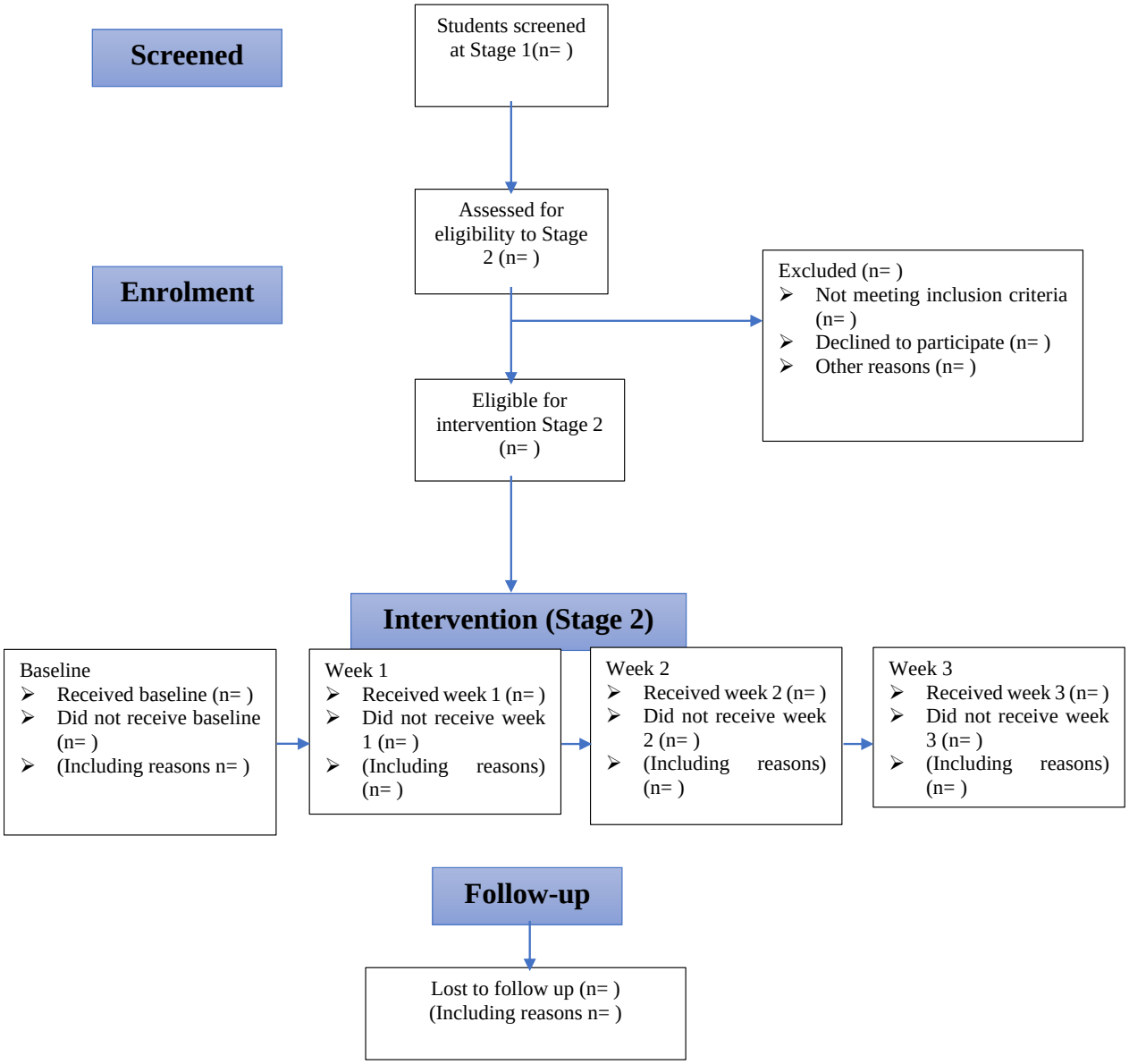
……

……

☺ Thanks for your time ☺

Appendix K. Participant Flow Diagram (CONSORT)

Figure 1: the diagram below has been adapted from the CONSORT guidelines for pilot and feasibility studies (Eldridge et al., 2010)



Appendix L. Participant Debrief Sheets

Norwich Medical School
Faculty of Medicine and Health Sciences
University of East Anglia
Norwich
NR4 7TJ

Sleeping Better Survey
Adolescent Debrief Sheet

Thank you for taking part in our survey! The aim of this study was to get some information about people's sleep and see if there were any similarities or differences between those who sleep well, and those who don't sleep as well. We are also looking for people to take part in a second study, so you may be contacted about this in the future.

Your results will be anonymously compared with those of other participants taking part in the study. If at any point you wish to withdraw your results or ask any questions about this study please email Hannah Cowie (H.Cowie@uea.ac.uk) or Alex Staines (A.Staines@uea.ac.uk).

The questionnaires tell us about your sleep, as well as how you have been feeling. Everyone's feelings go up and down from time to time. This is perfectly normal and nothing to worry about.

Sometimes we do go through times when we feel upset or down for quite a while. Usually people you already know can help; for example, parents, other family, a member of staff at school, or a friend. Sometimes it's useful to talk to someone else or read some information so we have suggested some useful resources below.

Thank you very much for helping us with this research. We hope you have found it interesting. We will be feeding back what we've found to the school once we have the results!

Support & Advice

Staff at your school
If you are having problems at school, whether it's keeping up in lessons, managing your homework, or getting on with others in your class, your Head of Year can help. They will talk to you about what you're finding difficult, and think about what could help. You can also speak to any staff member at school who can point you in the right direction.
Your General Practitioner (GP) (contact details vary)
Your GP will be able to offer support and advice on possible treatment options for any mental health difficulties. It can be helpful to take someone with you if you are not used to talking to them.

Books

Am I depressed? And what can I do about it? A CBT self-help guide for teenagers experiencing low mood and depression. Authors: Shirley Reynolds, & Monika Parkinson

(2015). Publishers: Constable & Robinson. This book is written for teenagers, and is available on Amazon.

Overcoming Low Self-Esteem: A self-help guide using cognitive behavioural techniques. Author: Melanie Fennell (1999). Publisher: Constable & Robinson. This book is a really easy to read guide on how to overcome difficulties with low self-esteem, a common problem for many young people.

Websites

Young Minds: www.youngminds.org.uk/
Young Minds is a charity committed to improving the mental health of young people. The website has information leaflets and ways to get support.

Northumberland self-help: https://www.ntw.nhs.uk/pic/selfhelp/
This website has some great free to download self-help leaflets, including ones on anxiety, depression, anger, and self-harm.

Mood Juice: http://www.moodjuice.scot.nhs.uk/
A self-help site full of resources for dealing with depression, anxiety and other difficulties.

M**ood Gym:** https://moodgym.anu.edu.au
Free web-based Cognitive-Behaviour Therapy (CBT) programme.

Childline: www.childline.org.uk
Lots of useful information. You can also email or speak to a counsellor online: http://www.childline.org.uk/talk/chat/pages/onlinechat.aspx

Papyrus: http://www.papyrus-uk.org Advice and support for young people dealing with self-harm and emotional distress and for those who are worried about them.

Helplines

Childline: 0800 11 11
Free confidential 24hr helpline for young people up to 19yrs old.

Samaritans: 08457 90 90 90
Free confidential 24 hour helpline.

Papyrus HOPELineUK 0800 068 41 41
Free confidential helpline for anyone concerned about a young person at risk of harming themselves. Open weekdays 10am – 5pm, 7pm – 10pm; weekends 2pm – 5pm.

Get Connected: 0808 808 4994
Free, confidential help for a wide range of issues for young people under 25.They also have a website: http://www.getconnected.org.uk/

Study leads:

Alex Staines
a.staines@uea.ac.uk
(insert research mobile number)

Hannah Cowie
h.cowie@uea.ac.uk
(insert research mobile number)

Norwich Medical School
Faculty of Medicine and Health Sciences
University of East Anglia
Norwich
NR4 7TJ

Adolescent Debrief Sheet

Title of study: Piloting a brief sleep intervention for adolescents in the community

Thank you for taking part in our study! The aim of this study was to test out a new programme to help people sleep better. We wanted to see if people find it helpful, and get some feedback about things that we need might need to change or improve. Additionally, we wanted to get some information about those who struggle to sleep to see if there are any similarities between these people.

Your results will be anonymously compared with those of other participants taking part in the study. If at any point you wish to withdraw your results or ask any questions about this study please email Hannah Cowie (H.Cowie@uea.ac.uk) or Alex Staines (A.Staines@uea.ac.uk).

The questionnaires tell us about your sleep, as well as how you have been feeling. Everyone's feelings go up and down from time to time. This is perfectly normal and nothing to worry about.

Sometimes we do go through times when we feel upset or down for quite a while. Usually people you already know can help; for example, parents, other family, a member of staff at school, or a friend. Sometimes it's useful to talk to someone else or read some information so we have suggested some useful resources below.

Thank you very much for helping us with this research. We hope you have found it interesting. We will be feeding back what we've found to the school once we have the results!

Support & Advice

Staff at your school
If you are having problems at school, whether it's keeping up in lessons, managing your homework, or getting on with others in your class, your Head of Year can help. They will talk to you about what you're finding difficult, and think about what could help. You can also speak to any staff member at school who can point you in the right direction.

Your General Practitioner (GP) (contact details vary)
Your GP will be able to offer support and advice on possible treatment options for any mental health difficulties. It can be helpful to take someone with you if you are not used to talking to them.

Books

Am I depressed? And what can I do about it? A CBT self-help guide for teenagers experiencing low mood and depression. Authors: Shirley Reynolds, & Monika Parkinson (2015). Publishers: Constable & Robinson. This book is written for teenagers, and is available on Amazon.

Overcoming Low Self-Esteem: A self-help guide using cognitive behavioural techniques. Author: Melanie Fennell (1999). Publisher: Constable & Robinson.
This book is a really easy to read guide on how to overcome difficulties with low self-esteem, a common problem for many young people.

Websites

Young Minds: www.youngminds.org.uk/
Young Minds is a charity committed to improving the mental health of young people. The website has information leaflets and ways to get support.

Northumberland self-help: https://www.ntw.nhs.uk/pic/selfhelp/
This website has some great free to download self-help leaflets, including ones on anxiety, depression, anger, and self-harm.

Mood Juice: http://www.moodjuice.scot.nhs.uk/
A self-help site full of resources for dealing with depression, anxiety and other difficulties.

M**ood Gym:** https://moodgym.anu.edu.au
Free web-based Cognitive-Behaviour Therapy (CBT) programme.

Childline: www.childline.org.uk
Lots of useful information. You can also email or speak to a counsellor online: http://www.childline.org.uk/talk/chat/pages/onlinechat.aspx

Papyrus: http://www.papyrus-uk.org Advice and support for young people dealing with self-harm and emotional distress and for those who are worried about them.

Helplines

Childline: 0800 11 11
Free confidential 24hr helpline for young people up to 19yrs old.

Samaritans: 08457 90 90 90
Free confidential 24 hour helpline.

Papyrus HOPELineUK 0800 068 41 41
Free confidential helpline for anyone concerned about a young person at risk of harming themselves. Open weekdays 10am – 5pm, 7pm – 10pm; weekends 2pm – 5pm.

Get Connected: 0808 808 4994
Free, confidential help for a wide range of issues for young people under 25.They also have a website: http://www.getconnected.org.uk/

Study leads:

Alex Staines

a.staines@uea.ac.uk
(insert research mobile number)

Hannah Cowie
h.cowie@uea.ac.uk
(insert research mobile number)

Appendix M. The Sleeping Better Programme

Sleeping Better Programme

Introductions

Therapist name:

Contact number: **0118 378 4682**

Treatment Aims:

This treatment aims to help you to develop a better sleeping routine to improve your sleep quality. We will:

- Provide tips to adjust your bedroom at night-time when you go to sleep.
- Reschedule your bedtime and adjust your bedtime routine.
- Work with your parent/guardian to help you with the intervention at home.

What should I expect from this treatment?

Help and support for dealing with your sleep difficulties

Top tips on how to get a better night's sleep

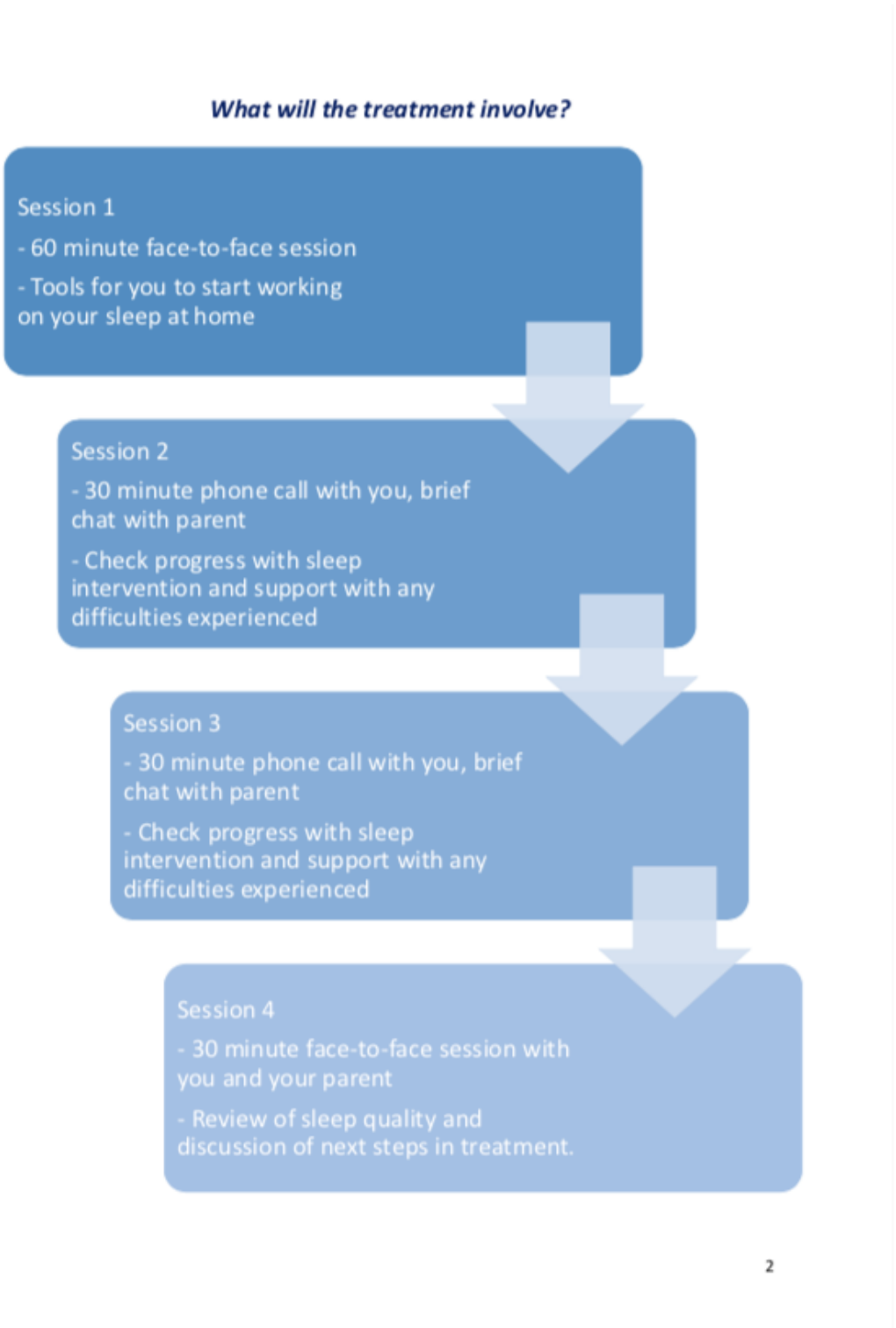
More information on how sleep problems can affect our mood

Tasks to complete between sessions which will help you improve your sleep

One-to-one sessions with a clinician who will support you every step of the way

A better quality of sleep, rather than a greater length of sleep

1


What will the treatment involve?
Session 1
- 60 minute face-to-face session
- Tools for you to start working on your sleep at home
Session 2
- 30 minute phone call with you, brief chat with parent
- Check progress with sleep intervention and support with any difficulties experienced
Session 3
- 30 minute phone call with you, brief chat with parent
- Check progress with sleep intervention and support with any difficulties experienced
Session 4
- 30 minute face-to-face session with you and your parent
- Review of sleep quality and discussion of next steps in treatment.
2

Treatment Goals

Goals are important to help us identify what we would like to achieve by the end of treatment. Making goals "SMART" can help us to do this. "SMART" goals stand for:

S: Specific

M: Measurable

A: Achievable

R: Realistic

T: Time-measured goals

Example:

Sally has recently had an argument with her friends and has started to feel low. She

now spends less time with her friends and struggles to get to sleep as she worries that her friends will never want to speak to her again. Sally now spends hours in bed on social media and is struggling to fall asleep. As a result she finds it hard to get up for school and has been late on a few mornings.

Sally's "SMART" goals could be:

Specific Measureable Realistic and Time-measured

Goal 1 "To be able to get up at 7am every day by the end of treatment"

Measurable

Goal 2 "To turn my phone off 1 hour before going to bed, every night, to be achieved in the next 2 weeks"

Specific Time-measured Realistic and achievable

3

Setting your own "SMART" Sleep Goals

In the spaces below, write down between 1 and 3 "SMART" goals relating to your sleep that you would like to achieve in treatment. Try to make these as "SMART" as possible! You can add or change these goals at each treatment session with your clinician.

GOAL 1:

.....
.....
.....

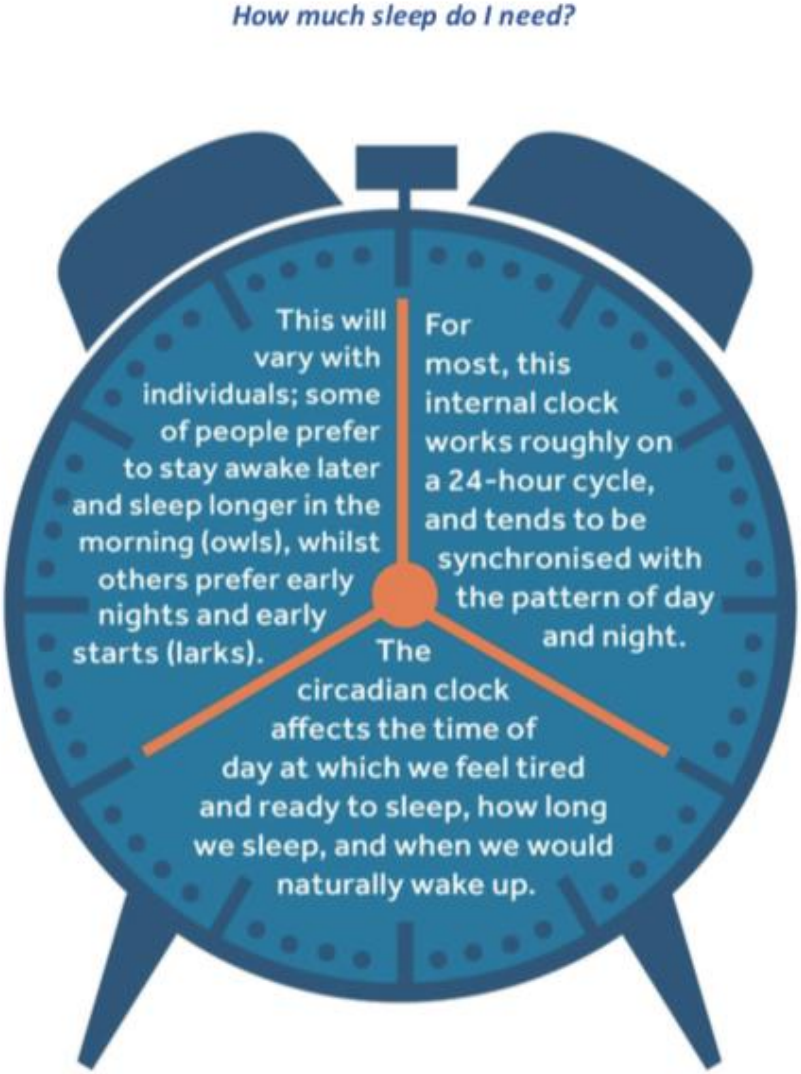
GOAL 2:

.....
.....
.....

GOAL 3:

.....
.....
.....

4


How much sleep do I need?
This will vary with individuals; some of people prefer to stay awake later and sleep longer in the morning (owls), whilst others prefer early nights and early starts (larks).
For most, this internal clock works roughly on a 24-hour cycle, and tends to be synchronised with the pattern of day and night.
The circadian clock affects the time of day at which we feel tired and ready to sleep, how long we sleep, and when we would naturally wake up.

5

The link between sleep and mood/anxiety

It's very common for people to have trouble sleeping at any age. It is normal to find it hard to sleep around important events, even positive ones such as parties or holidays. Excitement and anxiety can both keep us awake.

One or two nights of poor sleep is fine. However, if you have been sleeping badly for a few weeks, this may be a good time to try and change things.

Sleep problems as a biological symptom of depression and anxiety

- Sleep is a biological symptom of depression. Many young people who feel low experience sleep difficulties. This can make it harder to do the activities we enjoy, and can keep us feeling low.
- Sleep difficulties can also be a symptom of anxiety. Feeling anxious can make it hard to get to sleep, as we often have lots of worries going through our minds. We can also wake up in the night and find ourselves worrying. This can make it hard to get back to sleep.
- We can also wake up too early in the morning when we are feeling low or anxious.

Example: Alex

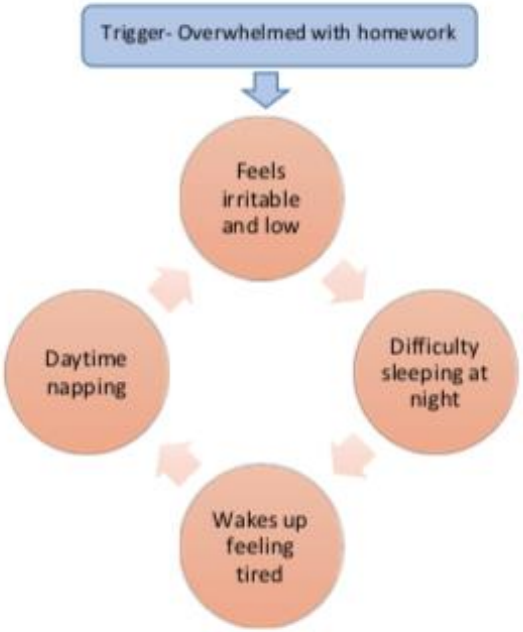
Alex has recently been finding it hard to get to sleep. He finds himself tossing and turning for hours on end. This prevents him from getting a good nights' sleep.

Is this something you have experienced?

These sleep problems can create a *vicious cycle*, with each problem making other difficulties harder to manage.

Example:

Sarah has recently been feeling overwhelmed with homework from school. She has noticed this has impacted her mood and ability to sleep at night. Below is an example of how Sarah's cycle could look:



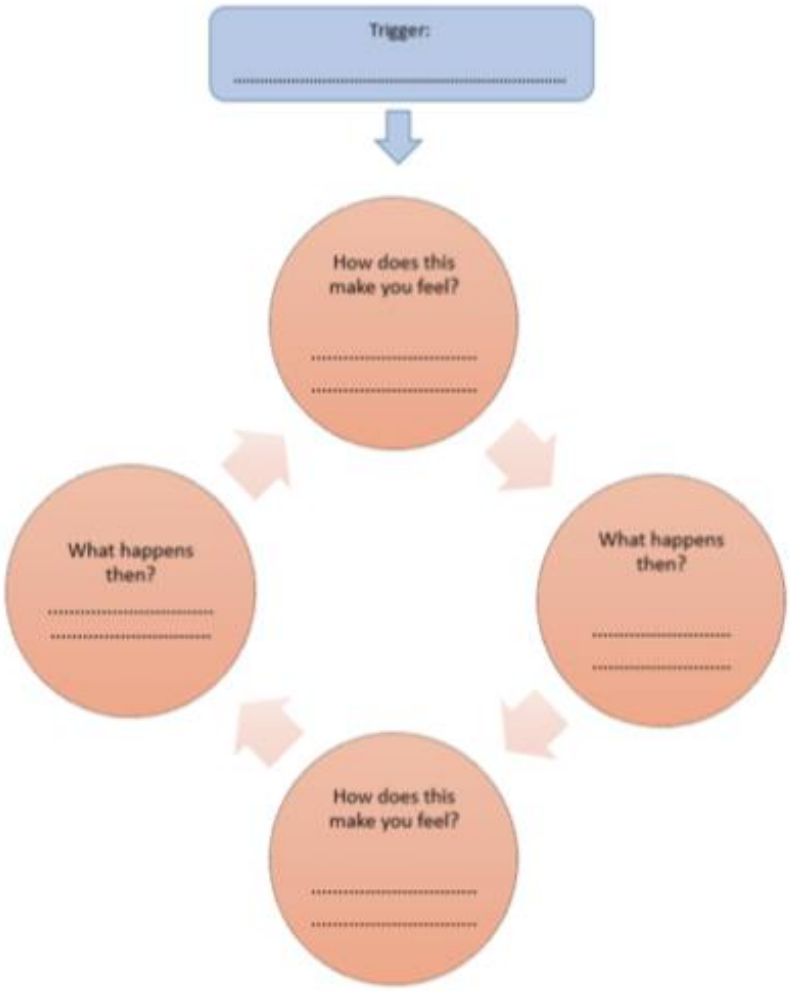
Everyone who experiences low mood and/or anxiety is likely to have a different set of experiences. However, there are often similar features you might recognise.

Some experiences are very common for teenagers and can be triggers for vicious cycles. Many young people may be bullied or have negative experiences with friends. Young people are also often under pressure from school to perform well in exams and coursework, and may be involved in other hobbies which add even more pressure.

Activity: What is your vicious cycle?

Below is a blank vicious cycle. See if you can identify your own vicious cycle, using the example above for guidance.

Do you notice that your sleeping problems are making you feel worse?



Activity: How have you been sleeping?

Hopefully you had a chance to complete the sleep diary over the last week. If you were unable to complete the diary, we have provided an example diary below.

If you did complete the diary, the example probably looks simpler than yours. This is only to make it easy to demonstrate how we use this information.

Martin's sleep diary…

MEASURING THE PATTERN OF YOUR SLEEP	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1. What time did you get into bed last night?	11:30	11:00	10:30	10:30	11:30	11:30	10:30
2. Lights Out:- At what time did you put the lights out and *intend* to go to sleep?	00:00	11:30	11:00	11:00	11:30	11:30	11:00
3. How long did it take you to fall asleep (minutes)? (After Lights Out)	30	30	60	30	30	0	30
4. How many times did you wake up during the night?	1	0	2	1	0	0	3
5. How long were you awake during the night (in total)?	30	0	30	30	0	0	60
6. What time did you wake this morning?	07:00	07:00	07:30	07:00	07:30	08:00	08:00
7. At what time did you get out of bed?	07:30	07:00	07:30	07:30	08:00	08:30	08:30
8. About how long did you sleep altogether (hours & mins)? Calculate from above	6:00	7:00	7:00	7:00	7:30	9:30	7:30
9. Convert total sleep time into minutes	360	420	420	420	390	570	450
10. About how long were you in bed altogether (hours & mins)? Calculate from above	8:00	8:00	9:00	9:00	8:30	9:00	10:00
11. Convert total time in bed into minutes	480	480	540	540	510	540	600

My Sleep Diary

Tips for completing your sleep diary can be found on the next page.

MEASURING THE PATTERN OF YOUR SLEEP	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1. At what time did you get into bed last night?							
2. Lights Out:- At what time did you put the lights out and *intend* to go to sleep?							
3. How long did it take you to fall asleep (minutes)? (After Lights Out)							
4. How many times did you wake up during the night?							
5. How long were you awake during the night (in total)?							
6. What time did you wake this morning?							
7. At what time did you get out of bed?							
8. About how long did you sleep altogether (hours & mins)? Calculate from above							
9. Convert total sleep time into minutes							
10. About how long were you in bed altogether (hours & mins)? Calculate from above							
11. Convert total time in bed into minutes							

How to understand your sleeping habits

In order to work out your sleeping habits, we need to do some maths.

We can work through this together on pen and paper or there is an electronic spreadsheet that helps you work it out.

At home you can do this with your parent/guardian, or have a go yourself, but we can also work through this together in our phone calls.

1. Calculate how long you slept on average over the past week (question 9 in the table).
    a. It is easiest to do this in minutes, and then convert to hours.

EXAMPLE:

Martin's week average is 432 minutes

(approx. 7 hours and 10 minutes)

How much sleep did you get on average over the past week?

2. Calculate your sleep efficiency.

    a. This is done by working out your average total sleep time (question 9) divided by the amount of time spent in bed (question 11). Then multiply by 100 to see as a percentage.

EXAMPLE:

The average time spent in bed for Martin is 527 minutes. The sleep efficiency would therefore be 432 ÷ 527 = 0.82

EXAMPLE:

Convert to a percentage by multiplying by 100: 0.82 x 100 = 82%

What is your sleep efficiency?

These calculations indicate that Martin is getting an average of just over 7 hours sleep per night, with a sleep efficiency of 82%. The sleep efficiency shows us how much time Martin spends asleep, when he is in bed.

We will come back to how we use total sleep time and sleep efficiency shortly.

Sleep rescheduling: What is it and why do we do it?

Sleep rescheduling aims to reschedule your sleeping pattern to 'reset your internal clock'. This doesn't mean you get more sleep but means that you will feel more rested and have more energy.

In the sleep diary we saw how to calculate the average time asleep, and the sleep efficiency. These numbers can help you to reschedule your sleeping pattern in the form of a 'sleep prescription'.

What is your 'sleep prescription'?

Your sleep diary has shown us how long you are asleep at night. We can use that to fit the amount of sleep you are getting into the perfect time window.

EXAMPLE:

Remember Martin, who is getting just over 7 hours sleep on average.

Martin does not need to get up until 6.30am, so based on what sleep Martin is getting currently, he should not go to bed until 11.30pm.

This is his *sleep prescription.* This will fit his current habit to the perfect window.

Try and work out your sleep prescription too in the box below.

We will now calculate your sleep prescription together in this appointment.

Why do we use sleep rescheduling and a 'prescription' to go to bed?

It can seem odd that going to bed later will improve your sleep quality. Sleep rescheduling works by making sure that more of your time in bed is actually used for sleeping. This means you will get a better night's sleep even though you are not in bed for as long.

Throughout the treatment we will be adjusting your sleep prescription based on your sleep efficiency, to improve your sleep quality.

If sleep efficiency is **over 90%** you can add 15 minutes onto your prescription.

If sleep efficiency is **85-90%** the sleep prescription stays the same.

If sleep efficiency is **85% or under**, you should remove 15 minutes from the prescription.

This means that as sleep efficiency gets better, time in bed can gradually increase. We will use your sleep diary to review and update your sleep prescription at each treatment session.

EXAMPLE:

Since Martin's sleep efficiency was 82%, he must remove 15 minutes from his sleep prescription, meaning that he must now go to bed at 11.45pm

How might we adjust your sleep prescription based on your sleep efficiency?

My Sleep Prescription

So, what time will you be going to bed every night over the next week (even on weekends)?

And what time will you be getting up?

15

Sleep Hygiene

Now we have looked at "Sleep Rescheduling", we will now focus on the second technique to help you sleep: "Sleep Hygiene"

1. **"Sleep Rescheduling" -** Adjusting your sleep routine, to provide you with a better nights' sleep.
2. **"Sleep Hygiene"** - Creating the right environment to sleep.

It is important to establish a good bedtime routine and habits to help you sleep. A key idea is to *make sure that your bedroom is associated with sleeping, not with being awake and active*. Key sleep hygiene suggestions are shown below:

16

My Sleep Hygiene

It can be useful to identify our current sleep habits, so that we can see different ways to improve our sleep. Below is an example of Martin's current sleep hygiene and ways to improve this.

Martin has been struggling with sleep for the past 4 weeks. He often drinks caffeinated drinks like fizzy drinks, Red Bull and coffee in the afternoon and has been struggling to stay active as he lacks energy. Martin also spends long periods of time on Snapchat before going to bed. Martin identified the following three ways to improve his sleep hygiene:

1. Stick to one fizzy drink each day: One can of Red Bull at lunchtime
2. Be more active: 10 minute walk around the park each day.
3. Stop using Snapchat 30 minutes before bed each day.

Using the information on the previous page, and Martin's example, think some ways to improve your sleep hygiene.

Improvement 1:

.....

.....

Improvement 2:

.....

.....

Improvement 3:

.....

.....

17

Before next time we'd like you to...

- Begin implementing your sleep 'prescription'
- Fill in your sleep diary
- Calculate your sleep efficiency

Our next appointment will be on: _____

A word of warning:

The first few days can be difficult. You may feel exhausted, grumpy, and find it difficult to concentrate at school.

This is completely **normal**!

It takes time for our bodies to adjust to something new. It's just like jet-lag from going on holiday to a different time zone. It takes our bodies around 3 days to adjust to a shift in time zones. The same is true with sleep rescheduling; our bodies need to adjust to the shift in time we go to bed.

Here are some of the positive changes you could experience if you follow your sleep prescription and get a better night's sleep:

- Fewer mood swings – less feeling angry and frustrated!
- You'll feel more energised – some of the tasks that seemed impossible before now seem that bit easier to do.
- Over time your memory can improve –our brain consolidates learning when we sleep.
- Creativity can improve
- Over time, your immune system strengthens – you will be less likely to get those horrible coughs and colds.

- Overall, your body will feel healthier
- You'll feel less sluggish and more able to concentrate – you may even see an improvement in your school work over time!
- You could experience a growth spurt – growth hormones are released when we sleep.
- Better relationship with your family and friends

Activity: What benefits do you notice from a better nights' sleep?

See if you can list some of the changes you notice when you start getting better quality sleep, no matter how small.

19

Parents need to look after themselves too

Supporting a teenager who is unhappy can have a big impact on ourselves as adults. Knowing where to find help and support for yourself is key to supporting your adolescent. Support and resources can be found on page 21 of this document, and you can ask for further support from the clinician during the treatment sessions too.

It is crucial to make sure that you are looking after yourself: getting enough sleep, eating well, getting exercise and having a social life and support from other people. Not only will this help you get through this difficult time, but it also provides a good 'model' to your teenager.

'Modelling' is a key idea in psychology. Children and adults learn in a number of different ways. They learn many behaviours and skills by watching other people. You are an important source of learning for your teenager – they are learning to be an adult, and you are likely to be one of the most important adults they know.

Resource Zone

During this treatment you will be asked to complete tasks outside of the sessions in your own time. The clinician is there to help you to take back control over your sleep and mood.

Below are a list of useful resources that can help you learn more about sleep problems and how you're feeling, you can look through these alone or with your parent/family:

Websites

YoungMinds: www.youngminds.org.uk

YoungMinds is a charity committed to improving the mental health of young people. The website has information leaflets and ways to get support.

Northumberland Self-Help: https://www.ntw.nhs.uk/pic/selfhelp

This website has some great free to download self-help leaflets, including ones on anxiety, depression, anger, and self-harm.

Mood Juice: http://www.moodjuice.scot.nhs.uk

A self-help site full of resources for dealing with depression, anxiety and other difficulties.

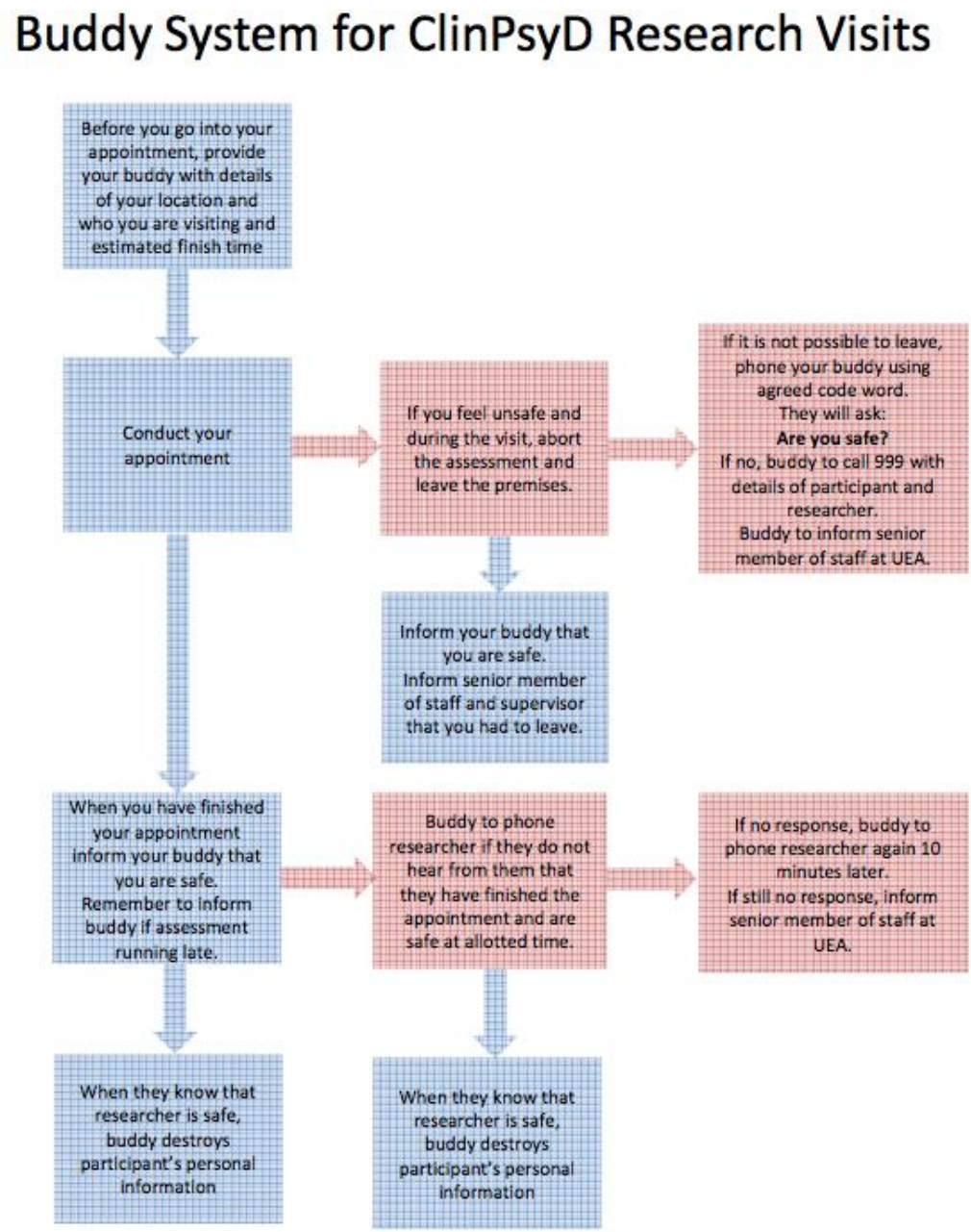
Childline: www.childline.org.uk
http://www.childline.org.uk/talk/chat/pages/onlinechat.aspx

This website has lots of useful information. You can also email or speak to a counsellor online.

Other useful websites for you or your parents:

- Australian Centre for Education in Sleep
  http://www.sleepeducation.net.au/adolescents.php
- Healthy Sleep
  http://healthysleep.med.harvard.edu/healthy/getting/overcoming/tips
- American Psychological Association
  http://www.apa.org/topics/sleep/why.aspx?item=1

Appendix N. Buddy Mentor Guidelines (UEA)



Appendix O. Ethics Confirmation

Initial ethics approval confirmation (05/12/2019)

Faculty of Medicine and Health Sciences Research Ethics Committee

University of East Anglia

NORWICH MEDICAL SCHOOL
Bob Champion Research & Educational Building
James Watson Road
University of East Anglia
Norwich Research Park
Norwich NR4 7UQ

Email: fmh.ethics@uea.ac.uk
www.med.uea.ac.uk

Hannah Cowie and Alex Staines
Doctoral Programme in Clinical Psychology
Norwich Medical School
University of East Anglia
Norwich
NR4 7TJ

5th December 2019

Dear Hannah and Alex

Piloting a brief sleep intervention for adolescents with insomnia symptoms
Reference: 001 2019/20

Thank you for your email of 15th November 2019 notifying us of the amendment you would like to make to your above proposal. This has been considered and I can confirm that your amendment has been approved.

Please can you ensure that any further amendments to either the protocol or documents submitted are notified to us in advance, and that any adverse events which occur during your project are reported to the Committee.

Approval by the FMH Research Committee should not be taken as evidence that your study is compliant with GDPR and the Data Protection Act 2018. If you need guidance on how to make your study GDPR compliant, please contact your institution's Data Protection Officer.

Please can you arrange to send us a report once your project is completed.

Yours sincerely

Prof Alastair Forbes
Chair
FMH Research Ethics Committee

Ammendments following changes

Ammendments request (24/02/2020)

RE: 2019/20-001 Cowie & Staines RE: Sleeping Better Project: Amendment request

From: Alex Staines (MED - Postgraduate Researcher) <A.Staines@uea.ac.uk>
Sent: 24 February 2020 15:00
To: FMH Ethics <fmh.ethics@uea.ac.uk>
Cc: Hannah Cowie (MED - Postgraduate Researcher) <H.Cowie@uea.ac.uk>; Lindsey Harding (FMH-LS - Staff) <L.Harding@uea.ac.uk>
Subject: Sleeping Better Project: Amendment request

PLEASE COULD THIS EMAIL BE FORWARDED TO PROFESSOR FORBES FOR CONSIDERATION

Dear Professor Forbes,
After careful consideration, and further liaison with our research supervisor, Professor Niall Broomfield, we would like to request two minor changes to Stage 2 of our Sleeping Better project:

1. We would like to ensure we use the consensus sleep diary (Carney et al., 2012), as this has been found to be the gold standard measure of subjective sleep. The sleep diary proposed to be used in our initial ethics application is similar, except for a question related to sleep quality.
2. We would like to include a measure of chronotype in Stage 2. It was felt after discussions that this should be addressed, especially given the (normal biological) spike in delayed sleep phase syndrome in adolescents. We appreciate this is another questionnaire for adolescents to complete, although it would only be for the intervention phase, and we feel it is highly important to capture in this population particularly. We would like to include the Morningness-Eveningness Questionnaire (Horne & Östberg., 1976) as this has been validated in an adolescent population and is considered the gold standard measure for chronotype. We would like to use the reduced 5-item measure (Daneilsson et al., 2019), to reduce time burden on participants.

Ammendments confirmation (05/03/2020)

Faculty of Medicine and Health Sciences Research Ethics Committee

University of East Anglia

Hannah Cowie and Alex Staines
Doctoral Programme in Clinical Psychology
Norwich Medical School
University of East Anglia
Norwich
NR4 7TJ

NORWICH MEDICAL SCHOOL
Bob Champion Research & Educational Building
James Watson Road
University of East Anglia
Norwich Research Park
Norwich NR4 7UQ

Email: fmh.ethics@uea.ac.uk
www.med.uea.ac.uk

5th March 2020

Dear Hannah and Alex

Piloting a brief sleep intervention for adolescents with insomnia symptoms
Reference: 2019/20-001

Thank you for your email of 24th February 2020 notifying us of the amendments you would like to make to your above proposal. These have been considered and I can confirm that your amendments have been approved.

Please can you ensure that any further amendments to either the protocol or documents submitted are notified to us in advance, and that any adverse events which occur during your project are reported to the Committee.

Approval by the FMH Research Committee should not be taken as evidence that your study is compliant with GDPR and the Data Protection Act 2018. If you need guidance on how to make your study GDPR compliant, please contact your institution's Data Protection Officer.

Please can you arrange to send us a report once your project is completed.

Yours sincerely

Prof Alastair Forbes
Chair
FMH Research Ethics Committee

Ammendments following COVID-19 lockdown

Request 20/03/2020

Re: 2019/20-001 (ethics amendment)

Sent: 20 March 2020 11:05
To: FMH Ethics <fmh.ethics@uea.ac.uk>; Lindsey Harding (FMH-LS - Staff) <L.Harding@uea.ac.uk>; Laura Pass (MED - Staff) <L.Pass@uea.ac.uk>
Cc: Hannah Cowie (MED - Postgraduate Researcher) <H.Cowie@uea.ac.uk>
Subject: reference; 2019/20-001 (ethics amendment)

Dear Professor Forbes,

Hannah and I would like to request another amendment to our Sleeping Better Project. We thank you again for your continued support in responding to our requests!

Given the COVID-19 pandemic, it is looking to be very difficult to be able to recruit students face to face for the foreseeable future (due to mass school closures). Therefore, we would like to request to be able to recruit students using online questionnaires. We would use the exact same questionnaires from our written pack but would need to have consent obtained online. We would make it mandatory for students to fully consent prior to having access to any of the questionnaires, using the same consent form we have used for our written copy which we have been using face to face.

We would also like to request to have all our Stage 2 Sleeping Better sessions over the phone or via skype, again given the situation.

We really would appreciate this change if possible.

Again, thank you for taking time to review our requests.

Many thanks,

Confirmation (30/04/2020)

Faculty of Medicine and Health Sciences Research Ethics Committee

University of East Anglia

Hannah Cowie and Alex Staines
Doctoral Programme in Clinical Psychology
Norwich Medical School
University of East Anglia
Norwich
NR4 7TJ

NORWICH MEDICAL SCHOOL
Bob Champion Research & Educational Building
James Watson Road
University of East Anglia
Norwich Research Park
Norwich NR4 7UQ

Email: fmh.ethics@uea.ac.uk
www.med.uea.ac.uk

30th April 2020

Dear Hannah and Alex

Piloting a brief sleep intervention for adolescents with insomnia symptoms
Reference: 2019/20-001

Thank you for your email of 20th March 2020 notifying us of the amendments you would like to make to your above proposal. These have been considered and I can confirm that your amendments have been approved.

Please can you ensure that any further amendments to either the protocol or documents submitted are notified to us in advance, and that any adverse events which occur during your project are reported to the Committee.

Approval by the FMH Research Ethics Committee should not be taken as evidence that your study is compliant with GDPR and the Data Protection Act 2018. If you need guidance on how to make your study GDPR compliant, please contact your institution's Data Protection Officer.

Please can you arrange to send us a report once your project is completed.

Yours sincerely

Prof Alastair Forbes
Chair
FMH Research Ethics Committee

COVID-19: *The FMH Research Ethics Committee procedures remain as normal. Please note that our decisions as to the ethics of your application take no account of Government measures and UEA guidelines relating to the coronavirus pandemic and all approvals granted are, of course, subject to these. If your research is COVID-19 related it will naturally be expedited. If the current situation means that you will have to alter your study, please submit an application for an amendment in the usual way.*

Appendix P. Sleep Webinar Slides

Understanding Sleep How Can I Get a Better Night's Sleep?

Email: sleeping.better@uea.ac.uk

About us

University of East Anglia

- Hannah Cowie
- Alex Staines

We are Trainee Clinical Psychologists at the University of East Anglia.

We are interested in sleep habits in young people and have been researching this as part of our thesis.

Your school might have sent you a questionnaire about your sleep, wellbeing and thinking styles. We have put together this presentation as a thank you for taking part, and to hopefully help give you some practical tips to help with your sleep habits.

Purpose of the presentation

- We have put together a 40-minute presentation to help you understand and learn practical techniques to promote better quality sleep…
  - Having a better idea of how sleep can affect our everyday lives
  - Learning about healthy bedtime routines
  - Tips to put in place to help us get a good night's sleep

Agenda

- Understanding more about sleep
- Understanding how much sleep we need
- Understanding why sleep is important
- Tips to improve my sleep

Keeping you safe

This presentation is not intended to bring up any difficult thoughts and feelings for you. However, if you feel you need some additional support, we have put together a variety of resources which are available at the end of the presentation. You can also contact your school or the wellbeing support there. We have also included our contact details if you had any specific questions about the presentation.

Key contacts

→ Hannah Cowie
→ Alex Staines

Research team:
Sleeping.better@uea.ac.uk

Sleep facts

- Research has shown in the UK under 25's sleep on average between 5.96 and 7.1 hours per night
- Recent research has found that parts of the brain are still developing up to the age of 25
- Sleep has important physical, mental and emotional processing components
- Why sleep?! Sleep is fundamental- in fact; you could survive for three times as long without food as you could without sleep!
- Therefore, it is important that we find ways of managing a good sleep routine

Different sleep problems

- Trouble falling asleep
- Waking up in the night
- Waking too early in the morning

Often leads to:

Long periods of night-time wakefulness

Insufficient amount of sleep at night

What type of sleeper are you?

- Over the centuries, a combination of genetics and environment have made it so some of us have evolved to feel at our best during daylight hours (morning lark), while others thrive at night (night owl)
- Morning people prefer to rise with the sun and feel the most energetic earlier in the day.
- Night owls, on the other hand, sleep later into the day, perhaps even past noon, and reach their peak after the sun goes down
- The differences between these two sleep patterns impacts on a persons preferred bedtime
- These are called chronotypes
- At the end there is a questionnaire if you wanted to find out what type of sleeper you are!

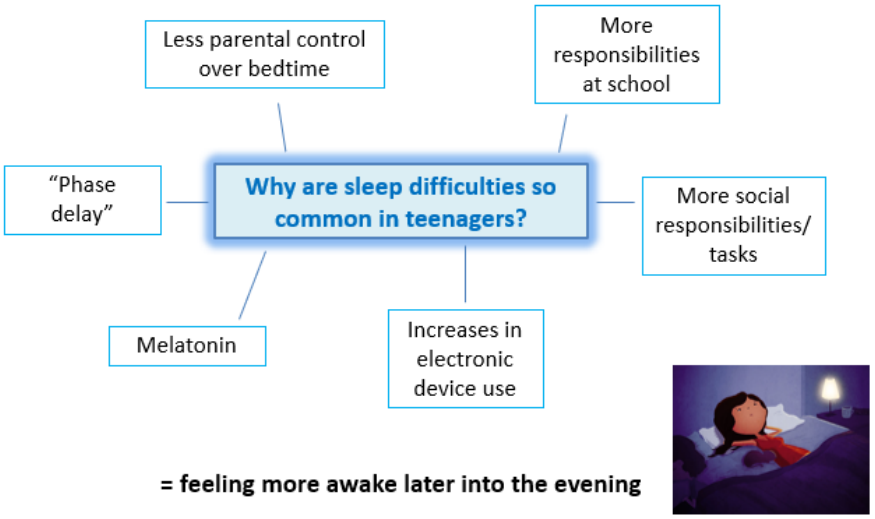
How much sleep do I need?

- "Teenagers 13 to 18 years of age should sleep 8 to 10 hours per 24 hours on a regular basis to promote optimal health."
- (Paruthi, 2016) American Academy of Sleep Medicine

- Varies from person to person
- It is not uncommon for people to have different sleeping patterns. Some people sleep for longer spells than others. This is fine as long as you are getting the right *amount* of sleep for you.

Sleep difficulties in adolescence

- **Roughly a third of young people experience sleep difficulties**



= feeling more awake later into the evening

Why is sleep important?

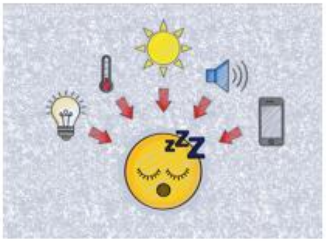
Why is sleep important?

Poor quality sleep	Good quality sleep
• Mood swings, irritability • Lack of energy, sluggish • Poorer concentration and attention • Increased risk of accidents or injuries	• Positive mood, better emotional regulation • Feeling more energised • Improved concentration and attention • Better memory, enhanced learning • Growth/ stronger immune system

Paruthi (2016)

How can I improve my sleep?

Sleep Hygiene



Sleep Hygiene

Practices and Tips

- Reducing caffeine (especially in the evening)
- Staying active, exercise
- Natural light: opening the curtains, spending time outside
- Comfortable bed, dark bedroom.
- Reducing use of electronics in the evening (tv, tablets, gaming devices, mobile phones…). 45mins-30mins before bed.

- Avoid clock watching during the night
- Detach from the day. Complete a daily diary of what you have achieved today and what you have to do tomorrow.

- Relaxing, wind down time e.g. bathing, reading, lower lights, comfortable pyjamas

Sleep Hygiene

Associating bed with sleep

It is important to establish good habits to help you sleep.

The key idea is to make sure that your bedroom is **associated with sleeping**, not with being awake and active.

Make sure you use **bed** for **sleep** and not other daily activities

=

For example:

- Try to complete homework at a desk or in a separate room
- Watch TV in the living room rather than in the bedroom

Only sleep in bed.

- Sleeping in other places, such as on the sofa, weakens the association between the bed and sleep
- Makes it harder to sleep in bed.

Sleep Hygiene
Associating bed with sleep

20 minute rule

- When trying to get to sleep, if you have remained awake for 20-30 minutes, you should get out of bed.
- This is to make sure we do not start associating our beds with being awake.
- Return to bed when you feel more tired

What can I do when I get out of bed that fits with my sleep hygiene tips?

Sleep Hygiene
Napping

Pizza dough analogy:
Our sleep is like pizza dough in that you can only spread it out so far until it gets holes in it.

→ If we are napping in the day, we are stretching out our sleep dough, so we are likely to have "holes" in our sleep when we come to nighttime.

So… we should try not to nap, in order to build up our "sleep pressure" for the night time.

Sleep Hygiene
My bedtime routine

Reflection:
Have a think about how you could improve your bedtime routine?

Read

Have a milky drink

Have a bath

Listen to music

Have a light snack

Listen to something relaxing

Sleep Schedule

- It is important to maintain a similar sleep-wake cycle, so our bodies can get into a rhythm
  - Keeping to a **regular** bedtime and waketime
- This includes weekends! 😱

→ Have a think about what your sleep schedule is like on school nights? How does that compare to the weekend?

- Sleep expert recommends a max. 2 hour lie in on the weekend.

This is where keeping a sleep diary can be really useful!

Sleep Schedule

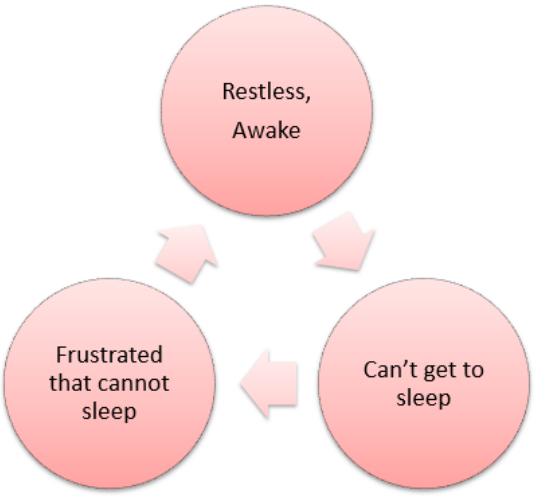
- Since we have to get up at a similar time each day, this doesn't mean we should go to bed earlier!

- If we go to bed too early, we'll be stretching our sleep dough too much → not building our sleep pressure.

Reminder:
-We should only get in bed when we feel sleepy - we want our brain to associate bed with sleepiness.

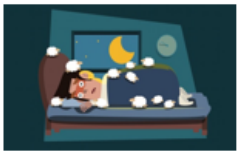
 = 

What to do if I can't fall asleep/wake up in the night?



What to do if I can't fall asleep/wake up in the night?

Distraction



We have all heard about counting sheep.

- This is based on the idea of **distracting ourselves**, but it tends to be a bit boring and a little too easy.
- Try something that is challenging, but that does not make you feel any particular emotions.

For example:

- Counting backwards from 1,000 in 7's.
- Word games or games based on categories (e.g. food, animals, capital cities…)
- Remember that we are all different, so some of us will be numbers people and others will prefer word or category games.

➢ **And don't forget… the 20 minute rule**

Other ideas

- Worries tend to feel much worse at night-time! You could try writing some of your worries down and putting these into a worry jar to come back to another time when you are not trying to sleep
- You could also try using cheerleading statements such as "this feels bad now, but tomorrow it will feel a bit better"

Summary

- Sleep difficulties are very common in young people
- Both the quality and quantity of sleep are essential for our mental health and wellbeing
- Sleep is vital for brain development, repair and restoration
- 7-8 hours is only an average – how many hours you need is individual to you
- There are practical strategies that we can put in place to promote better quality sleep
  - → Sleep hygiene
  - → Associating bed with sleep
  - → Sleep schedules
  - → Distraction techniques
  - → Worry techniques

And remember… you are not alone!

#

Chronotype questionnaire

ACTIVITY - Are you a night owl or an early bird?
Our bodies have an internal clock, called the circadian rhythm, that tells us when it is the best time for us to sleep, wake up, eat, do exercise, learn and a number of other things. Not everyone's body clock is the same. Some people feel their best in the morning, while other people feel their best at night. Some people can go to sleep easily early in the evening, while other people have trouble going to sleep before midnight.
Understanding your body clock will help you to understand what times of the day you are more productive and what times are the best for you to sleep.

CLICK THE LINK BELOW

https://www.sleephealthfoundation.org.au/pdfs/World%20Sleep%20Day/Activity%20-%20Morning-Eveningness%20Questionnaire.pdf

Resources...

Support & Advice

- **Staff at your school** - If you are having problems at school, whether it's keeping up in lessons, managing your homework, or getting on with others in your class, your Head of Year can help. They will talk to you about what you're finding difficult, and think about what could help. You can also speak to any staff member at school who can point you in the right direction.
- **Your General Practitioner (GP)** (contact details vary) - Your GP will be able to offer support and advice on possible treatment options for any mental health difficulties. It can be helpful to take someone with you if you are not used to talking to them.

Books

- **Am I depressed? And what can I do about it?** A CBT self-help guide for teenagers experiencing low mood and depression. Authors: Shirley Reynolds, & Monika Parkinson (2015). Publishers: Constable & Robinson. This book is written for teenagers, and is available on Amazon.
- **Overcoming Low Self-Esteem: A self-help guide using cognitive behavioural techniques.** Author: Melanie Fennell (1999). Publisher: Constable & Robinson. - This book is a really easy to read guide on how to overcome difficulties with low self-esteem, a common problem for many young people.

Websites

- **Young Minds**: www.youngminds.org.uk/ - Young Minds is a charity committed to improving the mental health of young people. The website has information leaflets and ways to get support.
- **Northumberland self-help:** https://www.ntw.nhs.uk/pic/selfhelp/ - This website has some great free to download self-help leaflets, including ones on anxiety, depression, anger, and self-harm.
- **Mood Juice:** http://www.moodjuice.scot.nhs.uk/ - A self-help site full of resources for dealing with depression, anxiety and other difficulties.
- **Mood Gym:** https://moodgym.anu.edu.au - Free web-based Cognitive-Behaviour Therapy (CBT) programme.
- **Childline:** www.childline.org.uk - Lots of useful information. You can also email or speak to a counsellor online: http://www.childline.org.uk/talk/chat/pages/onlinechat.aspx
- **Papyrus:** http://www.papyrus-uk.org Advice and support for young people dealing with self-harm and emotional distress and for those who are worried about them.

Resources

Helplines

- **Childline: 0800 11 11** - Free confidential 24hr helpline for young people up to 19yrs old.
- **Samaritans: 08457 90 90 90** - Free confidential 24 hour helpline.
- **Papyrus HOPELineUK: 0800 068 41 41** - Free confidential helpline for anyone concerned about a young person at risk of harming themselves. Open weekdays 10am – 5pm, 7pm – 10pm; weekends 2pm – 5pm.
- **Get Connected: 0808 808 4994** - Free, confidential help for a wide range of issues for young people under 25.They also have a website: http://www.getconnected.org.uk/

Appendix Q. The Reduced Morningness-Eveningness Questionnaire

Reduced Morningness-Eveningness Questionnaire

For each question, please select the answer that best describes you by circling the point value that best indicates how you have felt in recent weeks.

1. Approximately what time would you get up if you were entirely free to plan your day?

[5] 5:00 AM–6:30 AM (05:00–06:30 h)

[4] 6:30 AM–7:45 AM (06:30–07:45 h)

[3] 7:45 AM–9:45 AM (07:45–09:45 h)

[2] 9:45 AM–11:00 AM (09:45–11:00 h)

[1] 11:00 AM–12 noon (11:00–12:00 h)

2. During the first half hour after you wake up in the morning, how do you feel?

[1] Very tired

[2] Fairly tired

[3] Fairly refreshed

[4] Very refreshed

3. At approximately what time in the evening do you feel tired, and, as a result, in need of sleep?

[5] 8:00 PM–9:00 PM (20:00–21:00 h)

[4] 9:00 PM–10:15 PM (21:00–22:15 h)

[3] 10:15 PM–12:45 AM (22:15–00:45 h)

[2] 12:45 AM–2:00 AM (00:45–02:00 h)

[1] 2:00 AM–3:00 AM (02:00–03:00 h)

4. At approximately what time of day do you usually feel your best?

[5] 5–8 AM (05–08 h)

[4] 8–10 AM (08–10 h)

[3] 10 AM–5 PM (10–17 h)

[2] 5–10 PM (17–22 h)

[1] 10 PM–5 AM (22–05 h)

5. One hears about “morning types” and “evening types.” Which one of these types do you consider yourself to be?

[6] Definitely a morning type

[4] Rather more a morning type than an evening type

[2] Rather more an evening type than a morning type

[1] Definitely an evening type