

Effectiveness of Cognitive Behavioural Therapy to Improve Sleep Outcomes in Patients with Schizophrenia: A Systematic Review of Randomised Control Trials

Mona Aeysha Khalid

University of Stirling, Glasgow, UK
Email: mei3na4@gmail.com

How to cite this paper: Khalid, M. A. (2022). Effectiveness of Cognitive Behavioural Therapy to Improve Sleep Outcomes in Patients with Schizophrenia: A Systematic Review of Randomised Control Trials. *Open Journal of Social Sciences*, 10, 265-283.

<https://doi.org/10.4236/jss.2022.105018>

Received: March 12, 2022

Accepted: May 22, 2022

Published: May 25, 2022

Copyright © 2022 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Insomnia that could impair our social, personal, psychological, emotional and educational/professional functioning partially or fully is very common among patients of schizophrenia; and the schizophrenic symptoms associated with sleep disturbance, exacerbate on withdrawal of antipsychotic treatment. It is estimated that about 80% of people with psychosis also experience sleep disruptions and mostly suffer from chronic insomnia. In this context, cognitive behavioural therapy (CBT) is considered the most structured and beneficial technique to deal with insomnia in psychosis. However, due to the difficulties involved in the procedure, patients in the United Kingdom are still not receiving the optimum therapy from professionals. Thereby, this systematic review on CBT's effectiveness to improve sleep quality for patients with schizophrenia was carried out. It aims to explore the challenges one could face while adapting CBT for insomnia symptoms among psychotic patients and improve the interventions adaptability among psychotic patients. This review also explores the mechanisms and the contexts under which CBT helps improve patients' sleep quality (primary outcome) and psychological/emotional well-being (secondary outcome).

Keywords

Schizophrenia, Sleep Disorders, Insomnia, Cognitive Behavioural Therapy, Psychosis, Well-Being, Health

1. Introduction

Schizophrenia, a type of psychosis, affects more than 20 million people globally

(World Health Organization, 2022), and 1% of people experience psychotic symptoms at least once in their lives in the UK (NICE, 2014). As per Diagnostic Criteria (DSM-V), schizophrenia traits can be expressed through positive symptoms (hallucinations and delusions), negative symptoms (affective flattening, avolition, and alogia), disorganized speech, and catatonic behaviour (American Psychiatric Association, 2013; Royal College of Psychiatrists, 2017). Individuals may develop psychosis due to heredity, environmental stress, or adverse childhood experiences (Batinic, 2019). Sleep disruptions are strongly associated with psychotic experiences (Laskemoen et al., 2020) and can predict psychosis among at-risk populations (Reeve et al., 2018).

Insomnia is defined by difficulty commencing, maintaining, and restoring sleep, resulting in daytime dysfunction, mood variants, poor concentration, and fatigue (NICE, 2020; Sedky et al., 2020). The sleep's quality is poor enough to carry on day to day functioning properly, continue with educational goals successfully or maintain social relationships normally. The client never feels refreshed no matter how much sleep he has been gone through. He feels that he is usually awake while lying on the bed for long hours in order to get a sound sleep. It can be a disorder or coexist with other health conditions, increasing treatment burden and relapse of the disorder (Khurshid, 2018). There are two kinds of insomnia: acute and chronic. Acute insomnia, usually associated with environmental stress, lasts for less than three months, whereas chronic one sustains for a long time and is a common symptom in psychiatric/medical conditions, especially among psychotic patients (Afonso et al., 2011). It is estimated that about 80% of people with psychosis also experience sleep disruptions (Klingaman et al., 2015).

People with schizophrenia experience insomnia, mainly due to the coexisting factors such as sleep-related fixed beliefs, trauma, lifestyle, lack of motivation, and medication side-effects which affect their functioning, leading to disability (Chiu et al., 2016). Moreover, conditions such as hallucinations, delusions, irregular circadian rhythm, daytime inactivity, and bedtime fear also contribute to sleep disturbances (Waite et al., 2016). Conversely, sleep disturbances lead to cognitive deficits (Davies et al., 2017), weak processing speed and inhibition (Laskemoen et al., 2020), which put people at increased risk of suicidality (Miller et al., 2019; Malik et al., 2014), obesity (Palmese et al., 2011), stroke, diabetes (David et al., 2016) and depression and anxiety (Blanchard et al., 2020). Moreover, the causal link of insomnia with psychotic events (Reeve et al., 2017; Barrett et al., 2020) indicates a potential to treat it in the first place.

To treat comorbidity between insomnia and psychosis, antipsychotics are often referred (NICE, 2014); however, drugs may prove unhelpful or cause severe side effects to some patients. Therefore, to prevent the patients from delayed rehabilitation due to sleep deprivation, health care professionals recommend psychosocial interventions as the preferred treatment (Davidson et al., 2019; Brabban et al., 2009). These interventions include Open Dialogue, Psychosocial Inpatient/outpatient Treatment, Major Role Therapy (Cooper et al., 2020), and Mu-

sic Relaxation Therapy (Bloch et al., 2010). Among these, Cognitive Behavioural therapy is considered as the most structured and beneficial technique to deal with insomnia comorbidity with psychosis (Joober et al., 2017) delivered face to face (Chiu et al., 2018; Hwang et al., 2019) or online (Freeman et al., 2017; Denis et al., 2020).

1.1. Cognitive Behavioural Therapy

CBT is basically problem-solving focused therapy. It aims to alter thinking patterns within patients to activate positive change in behaviour. Cognitive psychologists study the cognitive areas (like thought processing, problem solving, perception, attention, memory and language) scientifically and have established framework in areas: schema theory, information processing model, and neuroscience model (Dobson & Dozois, 2019). CBT also deals with cognitive areas (negative perceptions of the world, negative beliefs, negative automatic thoughts, and negative concepts) termed as automatic thoughts (Kosugi et al., 2019). CBT not only attempts to change the present situation; rather it focuses on the change in the behaviour. At first it brings a change in perception or cognitive schemata, that sets a path for a change in behaviour which can also be observed. Thus, it makes the patients capable of changing their thought patterns and makes them able to take the steps to bring a change in their lives (Sheldon, 2011).

CBT based on educational model is based on the assumption that all behavioural reactions are learned therefore it aims to unlearn the behaviour that client wants to get rid of. Second important trait of CBT is that its techniques rely on the inductive methods which is based on the facts, not assumptions. The client is ready to test his self-created hypothesis and after testing its validity in the real world; he begins to think about changing his thinking according to the new information and understanding of the situation. Third important trait of CBT is that it uses the Socratic Method in which therapist tries to gain a deep understanding of clients' concerns (Clark & Egan, 2015). This is the best way for a therapist to find out the real causal factors to diagnose or treat clients' problems accordingly.

Evidence suggests that CBT, as an effective technique to deal with positive and negative symptoms while linking the contexts one perceives and behaves (Batinic, 2019; Millan et al., 2012), improves sleep quality (Ye et al., 2016) through controlling stimulus, restructuring thoughts, and relaxation training (Robertson et al., 2019). A systematic review conducted by Heller and colleagues (2021) through searching literature between 2002-2019 showed the effects of Cognitive Behavioural Therapy on pain perception when it is associated with self-knowledge and cognitive restructuring. It can be administered individually, at a group level, face to face, or online. These days digital CBT has gained much popularity and success (Freeman et al., 2017) with cost-effectiveness and feasibility (Luik et al., 2017). However, patients in the UK are still not getting the best treatment from clinicians (Barrett et al., 2020) due to either the complexity of CBT or the challenges involved in the implementation processes in terms of time, cost, and pa-

tient lifestyle (Rehman et al., 2017). Therefore, to deal with such barriers and improve the intervention's adaptability among psychotic patients, a systematic review on CBT's effectiveness to improve sleep quality will be carried out.

1.2. Objective

This study explores the mechanism through which CBT works effectively in the context of experiencing sleep disruptions under the paradigm of psychosis. It will explore the dimensions and the contexts under which CBT help improve the patients' sleep quality (primary outcome) and psychological/emotional well-being (secondary outcome). This information will help policymakers and health professionals to consider it before implementation.

2. Method

2.1. Inclusion Criteria

2.1.1. Type of Studies

Randomised Control Trials, peer-reviewed, with full-text availability, in English language, published in the last ten years (2010-2020), will be included. CBT is a widely discussed intervention in a range of mental disorders (Hofmann et al., 2012); however not so frequently discussed for insomnia in psychosis. Other systematic reviews discuss the intervention either within the context of multiple disorders (Thoma et al., 2015; Pigeon et al., 2017) or early psychosis (Davies et al., 2017; Hertenstein et al., 2019). Therefore, the search will be restricted to only RCTs to get evidence-based knowledge and insight for future recommendations.

2.1.2. Type of Participants

All adults (≥ 18), regardless of gender identity and ethnicity, diagnosed with schizophrenia or schizoaffective disorder or with psychotic symptoms (diagnosed by DSM-V or ICD-10), with short- or long-term conditions associated with sleep disturbances will be considered. However, participants diagnosed with sleep Apnoea and Parasomnia disorder will be excluded. Besides studies with mixed age groups, children, adolescents, or subgroups like army or prisoners will not be included. The sample of less than 10 participants, being underpowered, will also be excluded (Biau et al., 2008).

2.1.3. Type of Interventions

This review will include CBTI, the most preferred intervention to assess the sleep outcomes (Khurshid, 2018), including all modalities. Its efficacy has been established for both psychiatric disorders (e.g., schizophrenia) as well as non-psychiatric disorders (e.g., insomnia) (Chand et al., 2020). However, due to the disorder's complexity and its adjunctive nature with medication (Wong et al., 2019), antipsychotics cannot be excluded from the intervention.

2.1.4. Types of Comparators

The alternative therapy will be either a placebo or a standard treatment as usual

or a control group.

2.1.5. Types of Outcome Measures

In this review, both standardized self-reported and objective (wrist actigraphy) measures to assess sleep outcomes will be included. The outcomes reporting sleep quality (improvement or reduction), alone or with other psychotic experiences, will be considered.

2.2. Search Strategy

An online bibliographic search will be performed through databases: PubMed, Psych Info, and Cochrane Library using terms: “schizophrenia” OR “psychosis,” OR “schizoaffective disorder” OR “psychotic symptoms” AND “sleep disturbance” OR “insomnia” OR “sleep disruption” following the similar procedure used by Robertson et al. (2019). Through this reiterative process, all retrieved peer-reviewed research published within the last ten years (2010-2020), meeting initial criteria, will be exported to RefWorks Citation Manager. These studies will be further screened for duplication, predetermined criteria, and objectives to have a final list of studies to be included in this review. The PICO framework can be viewed in **Table A3** (see **Appendix B**).

2.3. Data Extraction and Quality Assessment

The selected papers will be assessed, and the following information will be extracted: study aims, study design, year of publication, sample size, sampling method, sample characteristics, sleep assessment tools, dimensions of CBT, characteristics of the control condition, sleep outcomes, time of measurement, follow-up, and setting.

The articles' quality will be assessed through the checklist provided by the Critical Appraisal Skills Programme, UK (CASP, 2018).

3. Results

3.1. Selection of Studies

In this process, at first databases PubMed, Cochrane and PsychInfo were explored for the relevant papers while applying the search criteria (see **Appendix B**) and 597 papers were selected for further screening. These papers were further examined for full text RCTs and 82 papers were extracted. Finally, while applying the inclusion and exclusion criteria, five most relevant RCTs were included in this review (see **Figure 1**).

The RCTs (1: Chiu et al., 2018; 2: Denis et al., 2020; 3: Freeman et al., 2015; 4: Freeman et al., 2017; & 5: Sheaves et al., 2018a) selected for this review have also been assessed for their quality (CASP, 2018) while assigning a number 1 for each “yes” out of total score “9” indicating low (0 - 3), moderate (4 - 6) and high quality (7 - 9). The three of these (1, 2, 5) qualified for the moderate, and two (3, 4) for high quality (**Table A2: Appendix A**).

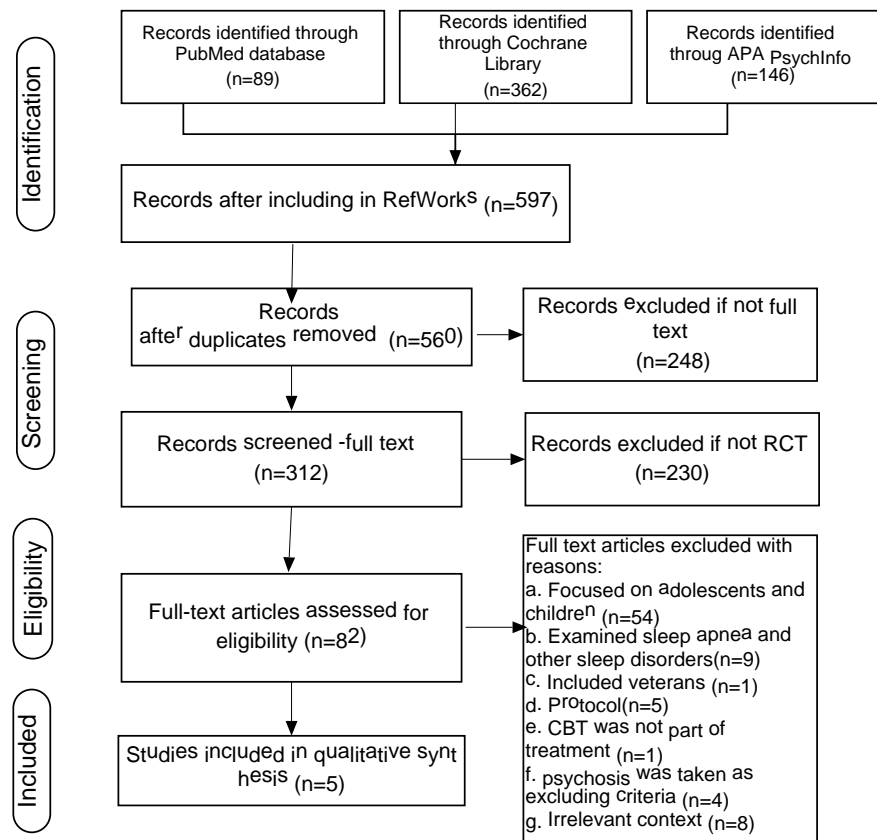


Figure 1. Prisma flow diagram for the systematic review.

3.2. Trials Characteristics

The summary of all the characteristics of data can be viewed in **Table A1 (Appendix A)**. Among these, most studies were conducted in the UK (2, 3, 4, 5) and one (1) in Australia. The three studies were delivered face-to-face (1, 3, 5), and the other two (2, 4) were administered online.

Three were pilot trials (2, 3, 5) mainly planned to evaluate the acceptability, adherence, cost effectiveness and efficacy of the therapy in target population. Participants were mostly British white, adult inpatients (5), outpatients (1, 3), and university students (2, 4). The mean age of the participants was 40 (median) years ranged from 20 to 41.4, and the mean proportion of male to female was 50%, including studies with male-only (5) and female-only (2). The sample size ranged from 40 to 3755.

Most participants had symptoms of insomnia (diagnosed or self-reported), and in most of the studies (1, 3, 5), were diagnosed with non-affective disorder. Various tools have been adopted in these studies to measure insomnia symptoms. Pittsburgh Sleep Quality Index (PSQI) in study 1, Sleep Condition Indicator (SCI) in 2, Insomnia Severity Index (ISI) in 3, ISI and SCI-8 in 4, and ISI was used in study 5 to assess sleep disruptions. All studies used self-reported measures to assess sleep outcomes except study 3, in which actigraphy was used to measure sleep-wake cycles.

CBT was delivered in six (3, 5) to eight (1, 2, 4) flexible sessions, following distinct assessment timing as well as separate follow-ups for each study starting from 6 weeks (1), through 12 weeks (5), 22 weeks (4), 24 weeks (3) until six months (2). CBTI in study 1 completed in 4 - 6 weeks with four weekly sessions. The “Sleepio” intervention in studies (2, 4) was delivered in six weekly online sessions. The most extended face-to-face schedule was 8 sessions over 12 weeks in study 3 (minimum dose 4). The most intensive STAC intervention in study 5 was delivered in 2 weeks with eight sessions (minimum dose 5).

The highest retention rate was in study 5 (100%), 96% provided follow-up in study 3, 80% completed more than two sessions in study 1, 69% reached mid intervention and 47% completed follow-up in study 2; and in study 4, 69% attended one, 50% two and 18% attended six sessions.

In all studies, CBTI has shown a significant improvement in insomnia symptoms ranging from small to medium effect in study 2 ($d = 0.42$) to large in 1, 3, 4 and 5 ($d = 0.66$; $d = 1.9$, $d = 1.1$, $d = 0.9$) respectively.

Regarding secondary outcomes, most studies (3, 4, 5) have reported significant improvement in psychological wellbeing with small to medium effect size ($d = 0.3$, $d = 0.29$, $d = 0.3$) respectively, as well as significant reductions in distress (1: $d = 0.4$) and stress (2). Some secondary outcomes related to psychotic symptoms being out of scope will not be addressed in this review.

3.3. Strengths

All the studies were Randomised Control Trials, the most rigorous method to ensure the reliability and validity of the results regarding research biases (Ernest et al., 2015). While avoiding selection bias, participants in all studies were randomly allocated to groups (treatment vs. control) except a study (1) in which it was not explicitly described. Similarly, other than one open-label study (1), in all trials, assessors were blind to the group allocations, minimising the effect of interpretation bias. To avoid the confounding variable effects, baseline similarities were also assessed in all studies.

All studies followed a systematic statistical procedure and provided evidence (95% CI) for the reliability and validity of results. Study 2 measured adherence to the therapy and study 3 reported fidelity of the therapy as well.

3.4. Weaknesses

Blinding the assessor, participants, and investigators from the allocation groups is always preferable to produce vigorous results in RCTs (Renjith, 2017) which is often not feasible in behavioural sciences. In this review, it was also not realistic to keep the participants/therapists blind from their group allocation due to the intervention’s specific nature. Thereby the intervention group may be influenced by the whole procedure but not specifically by the intervention. To resolve this issue, it is advised (Kendall, 2003) to keep the two groups similar. In this connection, only one study (2) has assigned an additional task, “puzzles,” to the

control group to compensate the intervention group's cognitive burden.

Moreover, the imbalance between males and females in all studies except one (1), warrants ascertainment bias, and the small sample size in most in-person trials could not provide promising results. However, variations in sample size, CBTI components, therapy sessions, and adherence are likely to be found equally in both delivery modes (Matthews et al., 2013; Ye et al., 2016) and pose severe validity threats.

3.5. CBT Evaluation

All studies utilized standard CBT elements: psychoeducation, goal setting, stimulus control, sleep restrictions, belief restructuring, circadian rhythm, articulatory suppression, paradoxical intention, daytime activity, mindfulness, relaxation techniques, and sleep hygiene, with few adaptations. For instance, in addition to exploring the effect of CBT on insomnia, study 1 also aimed to explore the sleep subtypes among psychotic patients and assessed the effectiveness of CBTI in clusters. Accordingly, clusters representing severe insomnia, regular sleep, and hypersomnia would need different strategies to manage sleep disruptions. Study 5 incorporated CBT elements in Sleep Treatment at Acute Crisis (STAC) intervention and adopted light/dark therapy (Wirz-Justice et al., 2013) to adjust biological clock in patients. Study 3 adapted CBT for the delusions and hallucinations.

Thus, in this systematic review, after careful evaluation of 597 studies, only five studies were included as per set inclusion/exclusion criteria. Among these Randomised Control Trials, Cognitive Behavioural Therapy was adapted for psychotic patients and insomnia symptoms improved alone or in combination with other psychological and physical symptoms.

4. Discussion

CBT in this review has shown a significant improvement in insomnia symptoms. This result is consistent with other studies (Hwang et al., 2019; Robertson et al., 2019). However, the primary aim to investigate the mechanisms underpinning CBT to reduce insomnia was not the objective of the studies included in this review. In this context, study 1 has offered a unique solution to enhance CBT's effectiveness on sleep outcomes by creating sleep profiles (1: classic severe insomnia; 2: insomnia with normal sleep; 3: insomnia with hypersomnia), revealing the significant effect of CBT on insomnia reduction. In addition to sleep profile, CBT has also shown improvement in daytime efficiency in people with psychosis as per their response type (strong responder, non-responder, selective responder) (Waters et al., 2020).

A similar perspective was discussed in study 5, in which a consistent sleep window was introduced as per patient type (morning type and evening type). Thus, given the patient's preference for chronotype, the implementation of therapy adapted. Consistent with this, Bradley et al. (2018) have utilized circa-

dian rhythm regulation techniques to improve young people's sleep quality.

Similarly, studies (1, 3) have shown a change in total sleep time and sleep efficiency by adopting strategies such as stimulus control, psychoeducation, beliefs restructuring, and sleep restrictions. Extending to this, a transdiagnostic treatment approach (Sheaves et al., 2018b), while utilizing some creative adaptations to CBT, has shown significant benefits of using objective measures for insomnia patients.

Online studies offer certain advantages over face-to-face regarding privacy, flexibility, and cost-effectiveness (Luik et al., 2017). Participants had flexibility to adopt the therapy at their own pace as per their needs (study 4). These designs are usually incorporated with an online library, community support, and message reminders through emails (study 2). Other web-based approaches based on fully automated systems provide evidence for the effectiveness of CBT's digital application (Espie et al., 2012). However online studies (2, 4) have shown a higher dropout rate (50%), which is a common factor in online studies (Scott et al., 2020).

All face-to-face trials in this review have shown a significant improvement in sleep outcomes. However, these trials have been conducted by trained clinical psychologists in highly controlled settings with strict schedules. It is not always feasible in real life, providing interventions with great intensity and validity (Addington & Lecomte, 2012). For instance, in study 3, 41% attending CBT, and 4% from the control group had no insomnia at week 12. This remarkable result could be due to extensive care (e.g., calls and text messages between sessions) and robust methodology to implement the intervention.

Moreover, these trials recruited in-active control groups which estimate an absolute effect size rather than a relative effect size (Karlsson & Bergmark, 2015). Trials with active control groups (Espie et al., 2012) can further explore the therapy effectiveness from various perspectives (Karlsson & Bergmark, 2015).

5. Limitations

The pilot trials in this review were not primarily conducted to assess which CBT elements bring a change in insomnia. Therefore, the focused information was not explicitly available. The second limitation was that the relevant studies included either comorbidities (excluding criteria) or psychosis as excluding criteria in their research. Moreover, the variant samples, like patients diagnosed with non-affective psychosis (1, 5, 3) with severe (1, 3, 4, 5) and mild (2) insomnia symptoms and university students (2, 4) with mild psychotic symptoms, restrict the generalizability of the results to a broader population.

6. Future Research

While enhancing the generalizability of the results, new research should be focused on more homogeneous samples, sharing more similarities in terms of psychological and physical health conditions. Similarly, it will be helpful to con-

sider cultural diversities and different belief systems to implement the intervention accurately (David et al., 2016). Insomnia is a contributing factor in psychosis (Reeve et al., 2018; Robertson et al., 2019). Therefore, assessing sleep outcomes associated with other psychiatric comorbidities and medication adherence would also be valuable.

Additionally, web-based interventions, being widely available in sleep disorders should also extend to mental health disorders (Pot-Kolder et al., 2020) and need to be integrated with traditional in-person approaches (Luik et al., 2017). Nevertheless, in addition to subjective reports, objective measures (watches) may also be incorporated in therapy (Sheaves et al., 2018b) to enhance credibility and patient motivation (Chiu et al., 2016).

7. Conclusion

CBTI has been successfully adapted across large populations, from patients diagnosed with a non-affective disorder to the general population with mild psychotic symptoms through an automatised online system or intensive face-to-face sessions. Still, to understand underlying mechanisms and to increase the availability and effectiveness of CBT on a large scale, more robust clinical trials would be required.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

- Addington, J., & Lecomte, T., (2012). Cognitive Behaviour Therapy for Schizophrenia. *F1000 Med Reports*, 4. <https://doi.org/10.3410/M4-6>
<https://facultyopinions.com/prime/reports/m/4/6/>
- Afonso, P., Viveiros, V., & Vinhas de Sousa, T. (2011). Sleep Disturbances in Schizophrenia. *Acta Medica Portuguesa*, 24, 799-806.
- American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders: DSM-5* (5th ed.). Sheridan Books Inc.
<https://doi.org/10.1176/appi.books.9780890425596>
- Barrett, E. A., Aminoff, S. R., Simonsen, C., & Romm, K. L. (2020). Opening the Curtains for Better Sleep in Psychotic Disorders—Considerations for Improving Sleep Treatment. *Comprehensive Psychiatry*, 103, Article ID: 152207.
<https://doi.org/10.1016/j.comppsy.2020.152207>
- 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, 297-307.
[https://doi.org/10.1016/S1389-9457\(00\)00065-4](https://doi.org/10.1016/S1389-9457(00)00065-4)
- Batinic, B. (2019). Cognitive Models of Positive and Negative Symptoms of Schizophrenia and Implications for Treatment. *Psychiatria Danubina*, 31, 181-184.
- Biau, D. J., Kernéis, S., & Porcher, R. (2008). Statistics in Brief: The Importance of Sample Size in the Planning and Interpretation of Medical Research. *Clinical Orthopedics and Related Research*, 466, 2282-2288. <https://doi.org/10.1007/s11999-008-0346-9>

- Blanchard, J. J., Andrea, A., Orth, R. D., Savage, C., & Bennett, M. E. (2020). Sleep Disturbance and Sleep-Related Impairment in Psychotic Disorders Are Related to both Positive and Negative Symptoms. *Psychiatry Research*, 286, Article ID: 112857. <https://doi.org/10.1016/j.psychres.2020.112857>
- Bloch, B., Reshef, A., Vadas, L., Haliba, Y., Ziv, N., Kremer, I., & Haimov, I. (2010). The Effects of Music Relaxation on Sleep Quality and Emotional Measures in People Living with Schizophrenia. *Journal of Music Therapy*, 47, 27-52. <https://doi.org/10.1093/jmt/47.1.27>
- Brabban, A., Tai, S., & Turkington, D. (2009). Predictors of Outcome in Brief Cognitive Behavior Therapy for Schizophrenia. *Schizophrenia Bulletin*, 35, 859-864. <https://doi.org/10.1093/schbul/sbp065>
- Bradley, J., Freeman, D., Chadwick, E., Harvey, A., Mullins, B., Johns, L. et al. (2018). Treating Sleep Problems in Young People at Ultra-High Risk of Psychosis: A Feasibility Case Series. *Behavioural and Cognitive Psychotherapy*, 46, 276-291. <https://doi.org/10.1017/S1352465817000601>
- Brooks, R., Rabin, R., & Charro, F. (2003). *The Measurement and Valuation of Health Status using EQ-5D: A European Perspective*. Kluwer Academic Publishers. <https://doi.org/10.1007/978-94-017-0233-1>
- Buysse, D. J., Reynolds, 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, 193-213. [https://doi.org/10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4)
- Chand, S. P., Kuckel, D. P., & Huecker, M. R. (2020). *Cognitive Behaviour Therapy*. National Library of Medicine. <https://pubmed.ncbi.nlm.nih.gov/29261869/>
- Chiu, V. W., Harvey, R. H., Sloan, N. B., Ree, M., Lin, A., Janca, A., & Waters, F. (2015). Cognitive and Behavioral Factors Associated with Insomnia in Inpatients with Schizophrenia and Related Psychoses. *The Journal of Nervous and Mental Disease*, 203, 798-803.
- Chiu, V. W., Ree, M., Janca, A., & Waters, F. (2016). Sleep in Schizophrenia: Exploring Subjective Experiences of Sleep Problems, and Implications for Treatment. *The Psychiatric Quarterly*, 87, 633-648. <https://doi.org/10.1007/s1126-015-9415-x>
- Chiu, V. W., Ree, M., Janca, A., Iyyalol, R., Dragovic, M., & Waters, F. (2018). Sleep Profiles and CBT-I Response in Schizophrenia and Related Psychoses. *Psychiatry research*, 268, 279-287. <https://doi.org/10.1016/j.psychres.2018.07.027>
- Clark, G., & Egan, S. (2015). The Socratic Method in Cognitive Behavioural Therapy: A Narrative Review. *Cognitive Therapy and Research*, 39, 863-879. <https://doi.org/10.1007/s10608-015-9707-3>
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A Global Measure of Perceived Stress. *Journal of Health and Social Behavior*, 24, 385-396. <https://doi.org/10.2307/2136404>
- Cooper, R. E., Laxhman, N., Crellin, N., Moncrieff, J., & Priebe, S. (2020). Psychosocial Interventions for People with Schizophrenia or Psychosis on Minimal or No Antipsychotic Medication: A Systematic Review. *Schizophrenia Research*, 225, 15-30. <https://doi.org/10.1016/j.schres.2019.05.020>
https://discovery.ucl.ac.uk/id/eprint/10077771/1/Cooper%20et%20al%202019_psychosocial%20review.pdf
- Critical Appraisal Skills Programme (CASP) (2018). *Randomised Controlled Trial Checklist*. <https://casp-uk.net/wp-content/uploads/2018/01/CASP-Randomised-Controlled-Trial-Checklist-2018.pdf>

- David, A. K., Vivek, P., Todd, A., & Christopher, L. D. (2016). DSM-5 Insomnia and Short Sleep: Comorbidity Landscape and Racial Disparities. *Sleep, 39*, 2101-2111. <https://doi.org/10.5665/sleep.6306>
- Davidson, J. R., Dickson, C., & Han, H. (2019). Cognitive Behavioural Treatment for Insomnia in Primary Care: A Systematic Review of Sleep Outcomes. *British Journal of General Practice, 69*, E657-E664. <https://doi.org/10.3399/bjgp19X705065>
- Davies, G., Haddock, G., Yung, A. R., Mulligan, L. D., & Kyle, S. D. (2017). A Systematic Review of the Nature and Correlates of Sleep Disturbance in Early Psychosis. *Sleep Medicine Reviews, 31*, 25-38. <https://doi.org/10.1016/j.smrv.2016.01.001>
- Denis, D., Eley, T. C., Rijsdijk, F., Zavos, H. M. S., Keers, R., Espie, C. A. et al. (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>
- Dobson, K. S., & Dozois, D. J. A. (2019). *Handbook of Cognitive-Behavioural Therapies*. The Guilford Press
- Ernest, P., Jandrain, B., & Scheen, A. J. (2015). Strengths and Weaknesses of Randomised Clinical Trials: Evolving Changes According to Personalized Medicine. *Revue medicale de Liege, 70*, 232-236.
- Espie, C. A., Inglis, S. J., Harvey, L., & Tessier, S. (2000). Insomniacs' Attributions. Psychometric Properties of the Dysfunctional Beliefs and Attitudes about Sleep Scale and the Sleep Disturbance Questionnaire. *Journal of Psychosomatic Research, 48*, 141-148. [https://doi.org/10.1016/S0022-3999\(99\)00090-2](https://doi.org/10.1016/S0022-3999(99)00090-2)
- Espie, C. A., Kyle, S. D., Hames, P., Gardani, M., Fleming, L., & Cape, J. (2014) The Sleep Condition Indicator: A Clinical Screening Tool to Evaluate Insomnia Disorder. *BMJ Open, 4*, Article ID: e004183. <https://doi.org/10.1136/bmjopen-2013-004183>
<https://bmjopen.bmj.com/content/4/3/e004183>
- Espie, C. A., Kyle, S. D., Williams, C., Ong, J. C., Douglas, N. J., Hames, P., & Brown, J. S. (2012). A Randomized, Placebo-Controlled Trial of Online Cognitive Behavioral Therapy for Chronic Insomnia Disorder Delivered via an Automated Media-Rich Web Application. *Sleep, 35*, 769-781. <https://doi.org/10.5665/sleep.1872>
- Freeman, D., Sheaves, B., Goodwin, G. M., Yu, L. M., Nickless, A., Harrison, P. J. et al. (2017). The Effects of Improving Sleep on Mental Health (OASIS): A Randomised Controlled Trial with Mediation Analysis. *The Lancet Psychiatry, 4*, 749-758. [https://doi.org/10.1016/S2215-0366\(17\)30328-0](https://doi.org/10.1016/S2215-0366(17)30328-0)
- Germain, A., Hall, M., Krakow, B., Katherine Shear, M., & Buysse, D. J. (2005). A Brief Sleep Scale for Posttraumatic Stress Disorder: Pittsburgh Sleep Quality Index Addendum for PTSD. *Journal of Anxiety Disorders, 19*, 233-244. <https://doi.org/10.1016/j.janxdis.2004.02.001>
- Heller, H. L., Borges, A. R., Franco, L. O. A., De Oliveira, Aucelio, J. P., Vargas, M. I. A., Lorga, R. N., Sales, M. B., Do Nascimento, N. V., Netto, G. F. R. B., Passos, B. C., Paes, B. P., Mendes, B. T., De Paula Gonçalves Sousa Lyra, B., Dos Santos, C. M. O. V., Do Nascimento Santos, A., De Oliveira, M. L. P., Da Silva, M. M., De Jesus, M. S., Storni, P. R.G. R., DeOliveira Ferraz, T. M., Peterle, V. C. U., & Reis, A. P. M. G. (2021). Role of Cognitive Behavioral Therapy in Fibromyalgia: A Systematic Review. *Open Journal of Rheumatology and Autoimmune Diseases, 11*, 169-187. <https://doi.org/10.4236/ojra.2021.114018>
- Hertenstein, E., Feige, B., Gmeiner, T., Kienzler, C., Spiegelhalter, K., Johann, A. et al. (2019). Insomnia as a Predictor of Mental Disorders: A Systematic Review and Me-

- ta-Analysis. *Sleep Medicine Reviews*, 43, 96-105.
<https://doi.org/10.1016/j.smrv.2018.10.006>
- Hofmann, S. G., Asnaani, A., Vonk, I. J., Sawyer, A. T., & Fang, A. (2012). The Efficacy of Cognitive Behavioral Therapy: A Review of Meta-Analyses. *Cognitive Therapy and Research*, 36, 427-440. <https://doi.org/10.1007/s10608-012-9476-1>
- Hwang, D.-K., Nam, M., & Lee, Y.-J. G. (2019). The Effect of Cognitive Behavioral Therapy for Insomnia in Schizophrenia Patients with Sleep Disturbance: A Non-Randomized, Assessor-Blind Trial. *Psychiatry Research*, 274, 182-188.
<https://doi.org/10.1016/j.psychres.2019.02.002>
- Joobar, R., Cole, K., Tabbane, K., & Boivin, D. B. (2017). An Algorithmic Approach to the Management of Insomnia in Patients with Schizophrenia. *Annals of Clinical Psychiatry*, 29, 133-144. <https://pubmed.ncbi.nlm.nih.gov/28463346/>
- Karlsson, P., & Bergmark, A. (2015). Compared with What? An Analysis of Control-Group Types in Cochrane and Campbell Reviews of Psychosocial Treatment Efficacy with Substance Use Disorders. *Addiction*, 110, 420-428.
<https://doi.org/10.1111/add.12799>
- Kendall, J. M. (2003). Designing a Research Project: Randomised Controlled Trials and Their Principles. *Emergency Medicine Journal*, 20, 164-168.
<https://doi.org/10.1136/emj.20.2.164>
- Khurshid, K. (2018). Comorbid Insomnia and Psychiatric Disorders. *Innovations in Clinical Neuroscience*, 15, 28-32.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5906087/>
- Klingaman, E. A., Palmer-Bacon, J., Bennett, M. E., & Rowland, L. M. (2015). Sleep Disorders among People with Schizophrenia: Emerging Research. *Current Psychiatry Reports*, 17, Article No. 79. <https://doi.org/10.1007/s11920-015-0616-7>
- Kosugi, N., Oshiyama, C., Kodama, N., & Niwa, S. (2019). Introduction of Music Therapy Incorporated into Cognitive Remediation: A New Approach to Cognitive Dysfunction in Psychiatric Disorders and a Preliminary Report on Its Effects in Schizophrenia. *Open Journal of Psychiatry*, 9, 23-38. <https://doi.org/10.4236/ojpsych.2019.91003>
- Krakov, B. J., Melendrez, D. C., Johnston, L. G., Clark, J. O., Santana, E. M., Warner, T. D., Hollifield, M. A., Schrader, R., Sisley, B. N., & Lee, S. A. (2002). Sleep Dynamic Therapy for Cerro Grande Fire Evacuees with Posttraumatic Stress Symptoms: A Preliminary Report. *Journal of Clinical Psychiatry*, 63, 673-684.
<https://doi.org/10.4088/jcp.v63n0804>
- Kroenke, K., Spitzer, R. L., Williams, J. B., & Löwe, B. (2009) An Ultra-Brief Screening Scale for Anxiety and Depression: The PHQ-4. *Psychosomatics*, 50, 613-621.
[https://doi.org/10.1016/S0033-3182\(09\)70864-3](https://doi.org/10.1016/S0033-3182(09)70864-3)
<https://pubmed.ncbi.nlm.nih.gov/19996233/>
- Laskemoen, J. F., Buchmann, C., Barrett, E. A., Collier-Hoegh, M., Haatveit, B., Vedal, T. J., Ueland, T., Melle, I., Aas, M., & Simonsen, C. (2020). Do Sleep Disturbances Contribute to Cognitive Impairments in Schizophrenia Spectrum and Bipolar Disorders? *European Archives of Psychiatry and Clinical Neuroscience*, 270, 749-759.
<https://doi.org/10.1007/s00406-019-01075-0>
- Luik, A. I., Kyle, S. D. & Espie, C. A. (2017). Digital Cognitive Behavioral Therapy (dCBT) for Insomnia: A State-of-the-Science Review. *Current Sleep Medicine Reports*, 3, 48-56. <https://doi.org/10.1007/s40675-017-0065-4>
- Malik, S., Kanwar, A., Sim, L. A., Prokop, L. J., Wang, Z., Benkhadra, K., & Murad, M. H. (2014). The Association between Sleep Disturbances AND Suicidal Behaviors in Patients with Psychiatric Diagnoses: A Systematic Review and Meta-Analysis. *Systematic*

- Reviews*, 3, Article No. 18. <https://doi.org/10.1186/2046-4053-3-18>
- Matthews, E. E., Arnedt, J. T., McCarthy, M. S., Cuddihy, L. J., & Aloia, M. S. (2013). Adherence to Cognitive Behavioral Therapy for Insomnia: A Systematic Review. *Sleep Medicine Reviews*, 17, 453-464. <https://doi.org/10.1016/j.smrv.2013.01.001>
- Millan, M. J., Agid, Y., Brüne, M., Bullmore, E. T., Carter, C. S., Clayton, N. S., Connor, R., Davis, S., Deakin, B., DeRubeis, R. J., Dubois, B., Geyer, M. A., Goodwin, G.M., Gorwood, P., Jay, T. M., Joëls, M., Mansuy, I. M., Meyer-Lindenberg, A., Murphy, D., Rolls, E., Saletu, B., Spedding, M., Sweeney, J., Whittington, M., & Young, L. J. (2012). Cognitive Dysfunction in Psychiatric Disorders: Characteristics, Causes and the Quest for Improved Therapy. *Nature Reviews Drug Discovery*, 11, 41-68. <https://doi.org/10.1038/nrd3628>
<https://pubmed.ncbi.nlm.nih.gov/22293568/>
- Miller, B. J., Parker, C. B., Rapaport, M. H., Buckley, P. F., & McCall, W. V. (2019). Insomnia and Suicidal Ideation in Nonaffective Psychosis. *Sleep*, 42, Article No. zsy215. <https://doi.org/10.1093/sleep/zsy215>
<https://pubmed.ncbi.nlm.nih.gov/30407600/>
- Mundt, J. C., Marks, I. M., Shear, M. K., & Greist, J. H. (2002) The Work and Social Adjustment Scale: A Simple Measure of Impairment in Functioning. *Br J Psychiatry*, 180, 461-464. <https://doi.org/10.1192/bjp.180.5.461>
- National Institute for Health and Care Excellence (NICE) (2014). *Psychosis and Schizophrenia in Adults: Prevention and Management*. <https://www.nice.org.uk/guidance/cg178>
- National Institute for Health and Care Excellence (NICE) (2020). *Insomnia*. <https://cks.nice.org.uk/insomnia#!scenario:1>
- 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, 263-271. [https://doi.org/10.1016/0005-7967\(85\)90004-X](https://doi.org/10.1016/0005-7967(85)90004-X)
- Palmese, L. B., DeGeorge, P. C., Ratliff, J. C., Srihari, V. H., Wexler, B. E., Krystal, A. D., & Tek, C. (2011). Insomnia Is Frequent in Schizophrenia and Associated with Night Eating and Obesity. *Schizophrenia Research*, 133, 238-243. <https://doi.org/10.1016/j.schres.2011.07.030>
- Pigeon, W. R., Bishop, T. M. & Krueger, K. M. (2017). Insomnia as a Precipitating Factor in New Onset Mental Illness: A Systematic Review of Recent Findings. *Current Psychiatry Reports*, 19, Article No. 44. <https://doi.org/10.1007/s11920-017-0802-x>
- Pot-Kolder, R., Smit, F., Jongeneel, A., Van Der Gaag, M., Veling, W., Geraets, C., Lokkerbol, J., & Ising, H. (2020). Cost-Effectiveness of Virtual Reality Cognitive Behavioral Therapy for Psychosis: Health-Economic Evaluation within a Randomized Controlled Trial. *Journal of Medical Internet Research*, 22, Article ID: e17098. <https://doi.org/10.2196/17098>
- Reeve, S., Emsley, R., Sheaves, B., & Freeman, D. (2017). Disrupting Sleep: The Effects of Sleep Loss on Psychotic Experiences Tested in an Experimental Study with Mediation Analysis. *Schizophrenia Bulletin*, 44, 662-671. <https://doi.org/10.1093/schbul/sbx103>
- Reeve, S., Nickless, A., Sheaves, B., & Freeman, D. (2018). Insomnia, Negative Affect, and Psychotic Experiences: Modelling Pathways over Time in a Clinical Observational Study. *Psychiatry Research*, 269, 673-680. <https://doi.org/10.1016/j.psychres.2018.08.090>
- Rehman, A., Waite, F., Sheaves, B., Biello, S., Freeman, D., & Gumley, A. (2017). Clinician Perceptions of Sleep Problems, and Their Treatment, in Patients with Non-Affective Psychosis. *Psychosis*, 9, 129-139. <https://doi.org/10.1080/17522439.2016.1206955>

- Renjith, V. (2017). Blinding in Radomized Controlled Trials: What Researchers Need to Know? *Manipal Journal of Nursing and Health Sciences*, 3, 45-50.
[https://www.researchgate.net/publication/315476836_Blinding_in_Randomized Contr olled_Trials_What_researchers_need_to_know](https://www.researchgate.net/publication/315476836_Blinding_in_Randomized_Contr olled_Trials_What_researchers_need_to_know)
- Robertson, I., Cheung, A., & Fan, X. (2019). Insomnia in Patients with Schizophrenia: Current Understanding and Treatment Options. *Progress in Neuro-Psychopharmacology & Biological Psychiatry*, 92, 235-242. <https://doi.org/10.1016/j.pnpbp.2019.01.016>
- Roenneberg, T., Wirz-Justice, A., & Mellow, M. (2003). Life between Clocks: Daily Temporal Patterns of Human Chronotypes. *Journal of Biological Rhythms*, 18, 80-90. <https://doi.org/10.1177/0748730402239679>
- Royal College of Psychiatrists. (2017). *Schizophrenia: Information for Young People*. <https://www.rcpsych.ac.uk/mental-health/parents-and-young-people/young-people/sc hizophrenia-information-for-young-people>
- Scott, A. J., Rowse, G., & Webb, T. L. (2020). The Effect of an Online Self-Help Cognitive Behavioural Intervention for Insomnia on Negative Affect and Paranoia: A Randomised Controlled Trial. *Health Psychology Bulletin*, 4, 39-52. <https://doi.org/10.5334/hpb.6>
<https://doi-org.ezproxy-s2.stir.ac.uk/10.5334/hpb.6>
- Sedky, K., Nazir, R., & Bennett, D. (Eds.) (2020). *Sleep Medicine and Mental Health*. Springer. <https://doi.org/10.1007/978-3-030-44447-1>
- Sheaves, B., Isham, L., Bradley, J., Espie, C., Barrera, A., Waite, F. et al. (2018b). Adapted CBT to Stabilize Sleep on Psychiatric Wards: A Transdiagnostic Treatment Approach. *Behavioral and Cognitive Psychotherapy*, 46, 661-675. <https://doi.org/10.1017/S1352465817000789>
- Sheldon, B. (2011). *Cognitive-Behavioural Therapy*. Routledge. <https://doi.org/10.4324/9780203833711>
- Tennant, R., Hiller, L., Fishwick, R. et al. (2007). The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS): Development and UK validation. *Health and Quality of Life Outcomes*, 5, Article No. 63. <https://doi.org/10.1186/1477-7525-5-63>
- Thoma, N., Pilecki, B., & McKay, D. (2015). Contemporary Cognitive Behaviour Therapy: A Review of Theory, History, and Evidence. *Psychodynamic Psychiatry*, 43, 423-461. <https://doi.org/10.1521/pdps.2015.43.3.423>
- Waite, F., Myers, E., Harvey, A. G., Espie, C. A., Startup, H., Sheaves, B., & Freeman, D. (2016). Treating Sleep Problems in Patients with Schizophrenia. *Behavioural and Cognitive Psychotherapy*, 44, 273-287. <https://doi.org/10.1017/S1352465815000430>
- Waters, F., Chiu, V. W., Dragovic, M., & Ree, M. (2020). Different Patterns of Treatment Response to Cognitive-Behavioural Therapy for Insomnia (CBT-I) in Psychosis. *Schizophrenia Research*, 221, 57-62. <https://doi.org/10.1016/j.schres.2020.03.054>
- Wirz-Justice, A., Benedetti, F., & Terman, M. (2013). *Chronotherapeutics for Affective Disorders: A Clinician's Manual for Light and Wake Therapy* (2nd Revised ed.). Karger. <https://doi.org/10.1159/isbn.978-3-318-02091-5>
- Wong, J. P. S., Ting, K. T., & Wong, A. W. S. (2019). Group Cognitive Behavioural Therapy for Psychosis in the Asian Context: A Review of the Recent Studies. *International Review of Psychiatry*, 31, 460-470. <https://doi.org/10.1080/09540261.2019.1634012>
- World Health Organization (2022, January 10). *Schizophrenia*. <https://www.who.int/news-room/fact-sheets/detail/schizophrenia>
- Ye, Y. Y., Chen, N. K., Chen, J., Liu, J., Lin, L., Liu, Y. Z., Lang, Y., Li, X. J., Yang, X. J., &

Jiang, X. J. (2016). Internet-Based Cognitive-Behavioural Therapy for Insomnia (ICBT-i): A Meta-Analysis of Randomised Controlled Trials. *BMJ Open*, 6, Article ID: e010707. <https://doi.org/10.1136/bmjopen-2015-010707>

Appendix A

Table A1. The summary of data characteristics extracted from the five selected articles.

Study Characteristics		Participant Characteristics			Intervention Condition			Measurement			Outcomes				
Author & Allocated No	Aims	Design	Age(years)	Sample Size	Setting	Sampling Procedure	Sleep Assessment Tools	Intervention	Control condition	Delivery Mode	Time of Intervention	Follow-up	Retention Rate	Sleep	Other
1. Chiu et al., 2018	To test the effect of CBT for insomnia on sleep subtypes among schizophrenic patients	A randomised controlled open label trial	Mean age = 41.4	N = 74 male = 39 (53%) female = 35 (47%) treatment = 50 control = 24	Outpatients with schizophrenia and sleep disruptions in Australia	Not mentioned	SHIK-B, PSQI: TST, SE, TIB SOL	CBTi	Treatment as usual	One to one	CBT delivered in 4 weekly sessions in 4 to 6 weeks	6 weeks	80% completed more than two sessions	Large reduction in insomnia at week 6 in each cluster f = 0.35 (web powered) Cohen's d = 0.66	Significant improvement in psychological distress (PHQ-4) f = 0.2 (web powered) Cohen's d = 0.4
2. Denis et al., 2020	To test CBTi effectiveness on patients with sub-threshold insomnia	A pilot randomised controlled trial. Assessor Blind	Mean age = 20	N = 199, Females = 100% male = 0% intervention = 99 control = 100	Participants are university students in UK	Randomisation based on blockrand package of R	SCI, PSQI, Dysfunctional beliefs and attitudes about sleep Q, Pre-sleep arousal scale, Sleep disturbances related to trauma & Munich chronotype questionnaire.	Digital CBTi intervention on an online platform "Sleepio" along with daily sleep diary	Control group receiving puzzles	Individually online	6-week intervention time and assessments at 3 week, 6 week and 6 months.	6 months	69% attended intervention, 68% completed the intervention, 47% completed the follow-up.	Significant improvement in insomnia full sample (d = 0.42); insomnia threshold at baseline (d = 0.21); did not meet insomnia threshold at baseline (d = 0.51)	Improvement in anxiety, paranoia, and stress (Perceived stress Scale)
3. Freeman et al., 2015	To test CBT for sleep problems in psychotic patients	A randomised controlled pilot trial -Assessor Blind	Mean age = 40.9	N = 50 male = 34 (67%) female = 16 (33%) treatment = 26 control = 24	Patients with insomnia and diagnosis of delusions or hallucinations from two UK centres	A web-based randomisation system	ISI	CBTi plus standard care	Standard care alone	One to one	8 sessions in 12 weeks	24 weeks	96% provided follow-up.	CBTi had significant effect on sleep at 12 weeks and maintained at 24 weeks, Cohen's d = 1.9.	Improved quality of life (d = 0.5) & psychological well-being (WEMWBS) at 12 weeks (d = 0.3)
4. Freeman et al., 2017	To test if insomnia is associated with paranoia and hallucinations	A randomised controlled trial. Assessor Blind	Mean age = 24.7	N = 3755 male = 1043 (28%) female = 2676 (71%) treatment = 1891 control = 1864	Students with insomnia from 26 UK universities	Simple randomisation with an automated online system	SCI-8 & ISI & DDNSI	Digital CBT called "Sleepio"	Treatment as usual	Individually online	CBT delivered in 6 sessions in 10 weeks. Assessments were taken at week 0, 3, 10 and 22	22 weeks	50% dropped out; 69% attended 1, 59% at least 2, 36% 3, 26% 4, 21% 5 & 18% attended 6 sessions.	Improvement in psychological well-being (WEMWBS), d = 0.29 at week 10, & functioning (WSAS), d = 0.58	Improvement in psychological well-being (WEMWBS) at week 2, d = 0.3
5. Sheaves et al., (2018a)	To test psychological treatment among patients at acute crisis	A randomised controlled pilot trial -Assessor Blind	Mean age = 40	N = 40 male = 40 (100%) female = 0 treatment = 20 control = 20	Patients from psychiatric inpatient ward in UK with self-reported insomnia symptoms	A web-based randomisation system	Sleep monitoring (ISI)	CBTi and light/dark therapy included in STAC	Standard care alone	One to one	flexible 8 sessions in 14 days. Assessments were taken at week 0, 2, 4 and 12	12 weeks	100% received treatment.	Large reduction in insomnia at week 2 and maintained at week 12 (d = 0.9)	Improvement in psychological wellbeing (WEMWBS) at week 2, d = 0.3

Key: CBT = Cognitive behavioural therapy; CBTi = Cognitive behavioural therapy for insomnia; DDNSI = Disturbing dreams and nightmare severity index (Kraakow et al., 2002); Dysfunctional beliefs and attitudes about sleep questionnaire (Espie et al., 2000); ISI = Insomnia severity index (Bastien et al., 2001); Light/dark therapy (Witz-Justice et al., 2013); Munich chronotype questionnaire (Roenneberg et al., 2003); PSQI = Pittsburgh sleep quality index (Buysse et al., 1989); PHQ-4 = Brief patient health questionnaire (Kroenke et al., 2009); Perceived stress scale (Cohen et al., 1983); Pre-sleep arousal scale (Nicassio et al., 1985); STAC = Sleep treatment at acute crisis; Sleep disturbances related to trauma (Germain et al., 2005); SE = Sleep efficiency; SOL = Sleep onset latency; SCI-8 = Sleep condition indicator 8-item version (Espie et al., 2014); SHIK-B = Sleep hygiene behaviour scale (Chiu et al., 2015); TST = Total sleep time; TIB = Time in bed; Quality of life (Brooks et al., 2003); WEMWBS = Warwick Edinburgh mental wellbeing scale (Tennant et al., 2007); WSAS = Work and social adjustment scale (Mundt et al., 2002).

Table A2. The results extracted from the CASP checklist for the selected five papers in this review.

CASP criteria appraisal for RCTs	1. Chiu et al., 2018	2. Denis et al., 2020	3. Freeman et al., 2015	4. Freeman et al., 2017	5. Sheaves et al., 2018a
Section A: Are the results of the trial valid?					
Q1. Did the trial address a clearly focused issue?	Yes	Yes	Yes	Yes	Yes
Q2. Was the assignment of patients to treatments randomised?	Yes	Yes	Yes	Yes	Yes
Q3. Were all of the patients who entered the trial properly accounted for at its conclusion?	Yes	Yes	Yes	Yes	Yes
Section B: Is it worth continuing?					
Q4. Were patients, health workers and study personnel blind to treatment?	No	No	No	No	No
Q5. Were the groups similar at the start of the trial?	No	No	No	No	No
Q6. Aside from the experimental intervention, were the groups treated equally?	Yes	Yes	Yes	Yes	Yes
Section C: What are the results?					
Q7. How large was the treatment?	Medium to Large effect	Small to medium	Large effect	Large effect	Large effect
Q8. How precise was the estimate of the treatment effect?	d = 0.66	d = 0.42	d = 1.9	d = 1.1	d = 0.9
Section C: Will the results help locally?					
Q9. Can the results be applied to local population or in your context?	Can't tell	yes	yes	yes	yes
Section D: Will the results help locally?					
Q10. Were all clinically important outcomes considered?	yes	No	yes	yes	No
Q11. Are the benefits worth the harms and costs?	yes	yes	yes	yes	yes
Appraisal Summary: Score out of 9	6	6	7	7	6
Study Quality	Moderate Quality	Moderate Quality	High Quality	High Quality	Moderate Quality

Interpretation of Scores: Low quality 0 - 3, Moderate quality 4 - 6, High quality 7 - 9 (CASP, 2018).

Appendix B

The PICO framework can be viewed from **Table A3**.

Table A3. The PICO framework for the review.

PICO	Inclusion Criteria	Exclusion Criteria
Population:	Adults: ≥18, have schizophrenia, schizoaffective disorder or psychosis (paranoia or hallucinations) with short- or long-term conditions associated with sleep disturbances	<18 years, Diagnosed as Sleep Apnoea or Parasomnia disorder Sleep disorder due to any other physical or medical condition
Intervention	Cognitive Behavioural Therapy for Insomnia	None provided at least one group received CBT

Continued

Comparison	Usual standard care or placebo or control group	None
Outcomes	Quality of sleep and Psychological Well-being	None

References for Studies Included in the Review

1. Chiu, V. W., Ree, M., Janca, A., Iyyalol, R., Dragovic, M., & Waters, F. (2018). Sleep Profiles and CBT-I Response in Schizophrenia and Related Psychoses. *Psychiatry Research*, *268*, 279-287.
<https://doi.org/10.1016/j.psychres.2018.07.027>
2. Denis, D., Eley, T. C., Rijdsdijk, F., Zavos, H. M. S., Keers, R., Espie, C. A., Luik, A. I., Badini, I., Derveeuw, S., Hodsoll, J., & 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>
3. Freeman, D., Waite, F., Startup, H., Myers, E., Lister, R., McInerney, J., Harvey, A. G., Geddes, J., Zaiwalla, Z., Luengo-Fernandez, R., Foster, R., Clifton, L., & Yu, L.-M. (2015). Efficacy of Cognitive Behavioural Therapy for Sleep Improvement in Patients with Persistent Delusions and Hallucinations (BEST): A Prospective, Assessor-Blind, Randomised Controlled Pilot Trial. *The Lancet Psychiatry*, *2*, 975-983.
[https://doi.org/10.1016/S2215-0366\(17\)30328-0](https://doi.org/10.1016/S2215-0366(17)30328-0)
4. Freeman, D., Sheaves, B., Goodwin, G. M., Yu, L.-M., Nickless, A., Harrison, P. J., Emsley, R., Luik, A. I., Foster, R. G., Wadekar, V., Hinds, C., Gumley, A., Jones, R., Lightman, S., Jones, S., Bentall, R., Kinderman, P., Rowse, G., Brugha, T. et al. (2017). The Effects of Improving Sleep on Mental Health (OASIS): A Randomised Controlled Trial with Mediation Analysis. *The Lancet Psychiatry*, *4*, 749-758.
[https://doi.org/10.1016/S2215-0366\(17\)30328-0](https://doi.org/10.1016/S2215-0366(17)30328-0)
5. Sheaves, B., Freeman, D., Isham, L., McInerney, J., Nickless, A., Yu, L.-M., Rek, S., Bradley, J., Reeve, S., Attard, C., Espie, C. A., Foster, R., Wirz-Justice, A., Chadwick, E., & Barrera, A. (2018a). Stabilising Sleep for Patients Admitted at Acute Crisis to a Psychiatric Hospital (OWLS): An Assessor-Blind Pilot Randomised Controlled Trial. *Psychological Medicine*, *48*, 1694-1704.
<https://doi.org/10.1017/S0033291717003191>