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Insomnia treatment in the context of alcohol use disorder: A systematic review and meta-analysis

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Abstract

Purpose—To determine the efficacy of behavioral and pharmacological interventions for insomnia among individuals with alcohol use disorder (AUD).

Procedures—Comprehensive literature searches of psychological, medical, and educational databases were conducted through October 2016. Eligible studies evaluated the efficacy of an insomnia intervention, included a comparison condition, sampled individuals with AUD and either insomnia disorder or complaints of insomnia, assessed sleep-related outcomes, and provided relevant statistics to calculate between-group effect sizes. Effect sizes were estimated for sleep quality, days of alcohol abstinence, and symptoms of depression. Type of intervention (behavioral versus pharmacological) was tested as a moderator of intervention efficacy.

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Author Disclosure

Contributors

Author MBM screened and reviewed articles for eligibility. KBC and LAJSS reviewed and provided feedback on potentially relevant articles. MBM and MLD extracted data. LAJSS conducted statistical analyses. All authors contributed to and have approved the final manuscript.

Conflict of Interest

The authors have no conflicts of interest to report.

Main Findings—Nine studies met eligibility criteria and were included in the final review and meta-analysis. Random-effects models indicated that intervention participants reported greater improvements in sleep quality ($d+ = 0.62$, 95%CI= 0.28, 0.97) and symptoms of depression ($d+ = 0.52$, 95%CI= 0.06, 0.98) than control participants. Participants reported significantly greater improvements in sleep quality in response to behavioral ($d+ = 1.20$, 95%CI= 0.70, 1.70) as opposed to pharmacological ($d+ = 0.43$, 95%CI= 0.19, 0.67) interventions. Behavioral ($d+ = 0.74$, 95%CI= 0.31, 1.18) and pharmacological ($d+ = 0.08$, 95%CI= -0.64, 0.78) interventions did not have significantly different effects on depressive symptoms. Neither behavioral nor pharmacological interventions improved rates of alcohol abstinence.

Conclusions—Insomnia interventions improve sleep quality and reduce symptoms of depression among individuals with comorbid AUD. Given the methodological weaknesses of studies reviewed, additional research is needed to determine the efficacy of insomnia treatment in improving rates of alcohol relapse within this population.

Keywords

sleep; drinking; alcohol dependence; depression; intervention

1. Introduction

Insomnia symptoms are common among individuals with alcohol use disorder (AUD), with rates as high as 74% among those who are actively drinking, 69% during early recovery, and 50% after four weeks of sobriety (Brower et al., 2001; Chaudhary et al., 2015; Kolla et al., 2014). Both insomnia and AUD have been associated with negative outcomes ranging from motor vehicle accidents to suicide (Bernert et al., 2015; Callaghan et al., 2013; Watson et al., 2015; Yoon-kyu et al., 2016). Together, these conditions exact substantial economic cost to the United States, with \$224 per year dedicated to the management of heavy alcohol use (Bouchery et al., 2011) and approximately \$100 billion spent on conditions associated with sleep disorders (Pollack et al., 2009). Thus, the co-occurrence of insomnia and AUD is prevalent and costly.

While the association between sleep and alcohol use is bidirectional (Chakravorty et al., 2016), symptoms of insomnia seem to play a unique role in the development and maintenance of substance use disorders. Difficulty initiating and maintaining sleep have been identified as prospective predictors of alcohol and other drug use in studies of children (Wong et al., 2009), adolescents (Hasler et al., 2016; Miller et al., 2017), and adults (Breslau et al., 1996; Weissman et al., 1997). Moreover, in the context of alcohol treatment, insomnia symptoms have been shown to precede and predict relapse to alcohol use (Brower et al., 2001; Malcolm et al., 2007; Smith et al., 2014). Thus, persistent insomnia symptoms may be barriers to effective, long-term recovery from AUD.

Given the negative impact of insomnia symptoms on alcohol-related outcomes, resolution of these symptoms may positively impact rates of alcohol relapse. Historically, the most common approach to insomnia treatment has been pharmacological. In general, pharmacological treatment of insomnia begins with a short- to intermediate-acting benzodiazepine receptor agonist (e.g., zolpidem or eszopiclone) (Schutte-Rodin et al., 2008).

However, these medications are generally avoided for patients with AUD due to potential for abuse and risk of overdose when used in combination with alcohol (Brower, 2015). Indeed, in a survey of addiction medicine physicians, only 22% of respondents reported offering insomnia medication to the majority of their AUD patients (Friedmann et al., 2003). Given that the majority of AUD patients report insomnia symptoms (Chaudhary et al., 2015), these data suggest that pharmacological treatment options for insomnia are underutilized for patients with AUD.

Over the past two decades, behavioral interventions have been recommended as the first line of treatment for insomnia in adults (Schutte-Rodin et al., 2008; Siebern and Manber, 2011). Cognitive Behavioral Therapy for Insomnia (CBT-I), in particular, has been effective in reducing insomnia symptoms, both as a primary diagnosis and in the presence of medical and psychiatric disorders (Siebern and Manber, 2011; Smith et al., 2005). Behavioral treatments may be preferable to medication in the context of AUD because they are longer-lasting and, theoretically, may break the cycle of using substances to manage distress (Brower, 2015).

Recent reviews have summarized the clinical manifestations, etiology, assessment, and treatment of insomnia in the context of AUD (Brooks and Wallen, 2014; Brower, 2015; Chakravorty, Chaudhary, et al., 2016). However, none have quantified the impact of various insomnia treatments on sleep- and alcohol-related outcomes. To fill this gap, we used meta-analysis to summarize the empirical evidence regarding the efficacy of insomnia interventions in improving sleep quality, rates of alcohol abstinence, and symptoms of depression among individuals with AUDs. We hypothesized that insomnia treatment would improve sleep quality among patients with AUD. Given the associations between insomnia symptoms and both relapse to alcohol use (Brower, 2015) and symptoms of depression (Li et al., 2016), we also hypothesized that insomnia treatment would improve rates of alcohol abstinence and symptoms of depression among patients with AUD. Finally, because behavioral treatment has been associated with longer-term improvements in insomnia than pharmacological treatment (Mitchell et al., 2012), we hypothesized that behavioral treatment of insomnia would be more effective than pharmacological treatment in improving sleep- and alcohol-related outcomes.

2. Method

2.1. Overview

This systematic review and meta-analysis was prepared using guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher et al., 2009). The PRISMA checklist can be found in the supplementary materials.

2.2. Eligibility Criteria

Studies were included if they (a) evaluated the efficacy of an intervention designed to improve insomnia-related sleep complaints, (b) included a control or comparison condition, (c) sampled individuals with AUD, (d) sampled individuals with insomnia disorder or complaints of insomnia, (e) assessed sleep-related outcomes, and (f) provided relevant

statistics to calculate between-group effect sizes. Studies were excluded if they (a) did not assess sleep and alcohol use in humans, (b) strictly reviewed the literature, (c) did not sample individuals with AUD, (d) did not evaluate a sleep intervention, (e) did not include a control or comparison condition, (f) sampled individuals who did not report a sleep complaint, (g) sampled individuals in alcohol withdrawal, or (h) did not report sleep-related outcomes (see Figure 1).

2.3. Information Sources

Comprehensive searches of psychological, medical, and educational databases were conducted to identify records that reported results of insomnia interventions for individuals with AUD. Electronic databases included PsycINFO, PubMed, EMBASE, Educational Resources Information Clearinhouse (ERIC), SocIndex, Cumulative Index to Nursing and Allied Health (CINAHL), Cochrane Library, Web of Science, Global Health, and ProQuest Dissertations. The electronic bibliographic database searches were conducted in October 2016. We also reviewed the reference sections of relevant reviews for any additional manuscripts not found from the electronic database searches.

2.4. Search Strategy

The database searches were conducted using a Boolean strategy to search for terms related to insomnia and alcohol use disorders. For example, the search string for PsycINFO included the following terms: (“alcohol use disorder” OR “alcohol dependence” OR “alcohol-related disorder” OR alcohol* OR “alcohol abuse”) AND (sleep OR insomnia OR nightmare*) AND (intervention OR prevention OR treatment OR therapy OR “drug therapy” OR pharmacological OR pharmacotherapy OR medication OR “medical treatment” OR RCT). The search terms were modified as needed to meet individual database search guidelines.

2.5. Study Selection

MBM screened and reviewed articles for eligibility criteria, first reviewing titles and abstracts of all records and then requesting full texts of those that were potentially relevant. KBC and LAJSS reviewed and provided feedback on potentially relevant records. The final set of studies included in the systematic review and meta-analysis were reviewed and agreed upon by all authors.

2.6. Data Collection and Items

The authors developed a data abstraction sheet for the present study, pilot tested it on 6 randomly selected records that met eligibility criteria, and refined it accordingly. Two trained reviewers independently extracted data regarding study information (e.g., publication year and source), sample characteristics (e.g., sample size, age), design and measurement specifics (e.g., recruitment method, number of follow-ups), length and content of the intervention (e.g., behavioral or pharmacological, inclusion of sleep education), and overall methodological quality from each article. Interrater reliability was assessed for all variables. For categorical variables, raters agreed on 81% of judgments (mean Cohen’s $k = 0.71$, indicating a moderate agreement; Landis and Koch, 1977). For continuous variables, raters

were in strong agreement (average intraclass correlation coefficient = 0.89). Discrepancies were resolved through discussion.

2.7. Risk of Bias in Individual Studies

The methodological quality of each article was assessed using 11 items from measures that have been validated in previous trials (Downs and Black, 1998; Jadad et al., 1996; Miller et al., 1995; Miller and Wilbourne, 2002). Reviewers determined the adequacy of methodological characteristics such as randomization, follow-up rate, follow-up length, attrition, and blinding. Meta-regression was used to examine the proportion of methodological quality criteria met as a predictor of study outcomes (sleep quality, alcohol abstinence, and depressive symptoms).

2.8. Summary Measures

Effect sizes (ES) were estimated for changes in sleep problems, days of alcohol abstinence, and symptoms of depression at the first available follow-up. We analyzed the first available follow-up because prior research shows that both behavioral and pharmacological interventions for insomnia produce the strongest effects immediately post-treatment (Edinger et al., 2001; Jacobs et al., 2004). Effect size estimates were calculated as the mean difference between the treatment and comparison conditions, divided by the pre-test standard deviation (Becker, 1988; Morris and DeShon, 2002).¹ Consistent with standard procedures (Lipsey and Wilson, 2001), other statistical information (e.g., frequencies, *p*-values) was used to estimate ES when means and standard deviations were not available. All ES were corrected for sample size bias (Hedges, 1981). Positive ES indicate improvements for the intervention compared to the control participants (i.e., improved sleep problems, more days of alcohol abstinence, and fewer depressive symptoms).

2.9. Planned Methods of Analysis

Weighted mean ES (d^+) were calculated using random-effects assumptions (Lipsey and Wilson, 2001). The 95% confidence interval surrounding each d^+ indicates the degree of precision of the mean effect size as well as its statistical significance. The homogeneity statistic (Q) was used to indicate the homogeneity of outcomes across studies. The I^2 index was also calculated to quantify the inconsistencies between ES (Higgins and Thompson, 2002; Huedo-Medina et al., 2006). Finally, we used a meta-analytic analogue to the ANOVA (following random-effects assumptions) to examine whether the type of intervention (pharmacological versus behavioral) moderated intervention efficacy. Publication bias could not be assessed due to the limited number of studies included in the meta-analysis (i.e., <10 studies; Lau et al., 2006).

¹For Currie et al. (2004), we excluded the waitlist control group and used self-help with telephone support as the comparison condition because the waitlist control group did not complete the same follow-ups.

3. Results

3.1. Study Selection

The electronic database searches provided a total of 11,001 records; after deleting duplicates, 8,324 records remained. Of these, 8,263 were excluded because the review of the record titles and abstracts indicated the records did not meet eligibility criteria. The full-text of the remaining 61 records were reviewed. Nine studies met eligibility criteria and were included in the final review and meta-analysis (see Figure 1).

3.2. Study Characteristics

Details regarding study characteristics are provided in Table 1. Studies were published (or available) between 1998 and 2016. Most studies (7 out of 9) were conducted in the United States; the two remaining studies were conducted in Belgium (Le Bon et al., 2003) and South Africa (Greeff and Conradie, 1998). Eight were randomized controlled trials (7 individual, 1 group), and one study used a quasi-experimental design (Karam-Hage and Brower, 2003).

3.2.1. Participants—Included studies involved 410 participants, 206 of whom were assigned to an active insomnia treatment condition. Primary inclusion criteria were AUD and either clinical diagnosis of insomnia ($n = 194$) or self-reported complaints of insomnia ($n = 216$). The majority of trials excluded participants with substance use disorders other than alcohol or nicotine; however, 66% of participants sampled in Karam-Hage and Brower (2003) met criteria for at least one other substance use disorder. Studies varied in the extent to which they assessed and reported current substance use treatment. Three studies recruited samples exclusively from either inpatient (Greeff and Conradie, 1998; Le Bon et al., 2003) or outpatient (Karam-Hage and Brower, 2003) treatment settings, and all participants were engaged in treatment during the course of the study. Friedmann and colleagues (2008) recruited recently detoxified patients from a short-term inpatient detoxification program, and 25% of their sample had engaged in formal substance use treatment by one-month follow-up. The remaining trials recruited from both clinic and community samples, and the percentage of participants receiving formal treatment was inconsistently reported. Retention was high, with a mean of 81% ($SD = 0.17$) retained at post-test.

3.2.2. Interventions—All interventions targeted symptoms of insomnia. Four studies utilized a behavioral insomnia intervention [three CBT-I and one Progressive Muscle Relaxation (PMR)], and five utilized pharmacological therapy (two gabapentin, two trazodone, and one quetiapine). Details regarding intervention frequency, duration/dose, and content are summarized in Table 1. The majority of interventions were delivered in person, although one involved both in-person and telephone support (Arnedt et al., 2011). Four interventions involved components of sleep education, two involved relaxation training, and one included alcohol education.

3.2.3. Comparisons—Of the four behavioral intervention trials, two implemented a comparison condition that was matched for both content and time; the other two utilized assessment-only controls. Of the five pharmacological trials, four utilized a time-matched

placebo and one (Karam-Hage and Brower, 2003) used trazodone as an active medication comparison.

3.2.4. Outcome Assessment—The outcomes of interest in this study were sleep quality, days of alcohol abstinence, and symptoms of depression. Sleep quality was measured in one study using the daily sleep diary, in one study using an unpublished measure, in two studies using the Sleep Problems Questionnaire (Jenkins et al., 1988), in three studies using the Pittsburgh Sleep Quality Index (Buysse et al., 1989), and in three studies using the Insomnia Severity Index (Morin et al., 2011) (see Table 1). In two studies, authors measured both ‘sleep quality’ and ‘insomnia symptoms.’ Given the overlap in these phenomena, scores were averaged to create an overall ‘sleep quality’ score that could be used in the meta-analysis. Studies that assessed days of abstinence or relapse did so using the Timeline Followback interview (Sobell et al., 1988); a single study did not report how alcohol abstinence was assessed (Karam-Hage and Brower, 2003). Measures of depression included the Beck Depression Inventory (Beck et al., 1996), the Patient Health Questionnaire-9 (Kroenke and Williams, 2001), the Quick Inventory of Depressive Symptomatology (Rush et al., 2003), and the Hamilton Rating Scale for Depression (Hamilton, 1967) (see Table 1).

3.3. Risk of Bias within Studies

The studies satisfied a mean of 62% (SD = 0.18; range = 31–88%) of the methodological quality criteria. Overall, 89% of studies randomized individuals or groups to treatment but only 44% reported blinding facilitators to which participants were in the intervention and control groups. Most studies conducted assessments less than 3 months post-intervention (56%); 67% used methods to minimize assessment reactivity (e.g., using separate intervention and assessment staff); 56% used some form of objective measurement; and 11% obtained collateral verification of self-report measures. Participant retention was moderate, with 55% of studies reporting retention rates of 70% or higher. Only 33% of studies compared drop outs to completed cases. Finally, all studies used appropriate statistical analyses for between-group differences, and 67% accounted for attrition in outcome reporting. The proportion of methodological quality criteria achieved (see Table 1) was not a significant predictor of sleep quality ($B = -0.48$, $p = .64$), alcohol abstinence ($B = -1.68$, $p = .18$), or depressive symptoms ($B = -2.95$, $p = .21$).

3.4. Summary of Effects

3.4.1. Sleep Quality—Data regarding sleep quality were available for eight trials (see Figure 2). In the pooled analysis, there was a significant difference in sleep quality between intervention and control groups ($d^+ = 0.62$; 95% CI = 0.28, 0.97); however, we failed to reject the null hypothesis of homogeneity ($Q[7] = 12.82$, $p = .08$; $I^2 = 45$, 95% uncertainty limits = 0, 76). Intervention type significantly moderated sleep quality ($Q[1] = 7.41$, $p < .001$), with participants reporting significantly greater improvements in sleep quality in response to behavioral ($d^+ = 1.20$; 95% CI = 0.70, 1.70) as opposed to pharmacological interventions ($d^+ = 0.43$; 95% CI = 0.19, 0.67).

3.4.2. Alcohol Abstinence—Data regarding abstinence outcomes were available for six trials (see Figure 3), which randomized 370 participants and reported first follow-up data for

327 participants. There were no between-group differences in rates of abstinence ($d+ = 0.09$; 95% CI = $-0.49, 0.68$). The null hypothesis of homogeneity was rejected ($Q[6] = 28.67, p < .001$; $I^2 = 79$, 95% uncertainty limits = 57, 90). Intervention type did not significantly moderate treatment outcomes (behavioral $d+ = 0.24$, 95% CI = $-0.74, 1.23$; pharmacological $d+ = 0.00$, 95% CI = $-0.77, 0.78$; $Q[1] = 0.14, p = .71$).

3.4.3. Depressive Symptoms—Data regarding symptoms of depression were available for five trials (see Figure 4), which randomized 139 participants and reported follow-up data for 99 participants. There was a significant difference between groups ($d+ = 0.52$; 95% CI = $0.06, 0.98$). We failed to reject the null hypothesis of homogeneity ($Q[4] = 5.73, p = .22$; $I^2 = 30$, 95% uncertainty limits = 0 to 73). Moderator testing did not reveal a statistically significant difference in depressive symptoms between behavioral ($d+ = 0.74$, 95% CI = $0.31, 1.18$) and pharmacological interventions ($d+ = 0.08$, 95% CI = $-0.64, 0.78$; $Q_B(1) = 2.44, p = .118$).

4. Discussion

This systematic review and meta-analysis evaluated the efficacy of insomnia interventions among individuals with comorbid AUD. We integrated the results of nine trials involving 410 alcohol dependent participants. Both behavioral and pharmacological insomnia interventions improved sleep quality and depressive symptoms among individuals with comorbid AUD, although improvements were stronger for behavioral interventions. Neither behavioral nor pharmacological interventions improved rates of alcohol abstinence within this population. Collectively, there is strong evidence for the efficacy of insomnia interventions in improving sleep quality among individuals with AUD; however, data regarding the secondary benefits of such interventions (e.g., reduced rates of alcohol relapse) were limited.

Both behavioral and pharmacological interventions improved sleep quality among individuals with AUD. However, behavioral interventions demonstrated much larger and more consistent effects. Of the behavioral treatments available, CBT-I was the primary intervention investigated. Consistent with previous studies examining the efficacy of CBT-I among those with psychiatric or medical disorders (Smith et al., 2005), CBT-I was highly effective in improving sleep quality among individuals with comorbid AUD, with all available studies indicating large effects. Notably, PMR also demonstrated strong effects on sleep quality and was included as a part of the intervention in at least one CBT-I trial. Thus, relaxation training may also help reduce sleep complaints among individuals with AUD. This conclusion is consistent with the results of a previous meta-analytic review, in which relaxation, cognitive-behavioral, and strictly behavioral interventions all demonstrated robust effects on sleep quality and symptoms of insomnia among middle-aged and older adults; however, cognitive behavioral techniques were needed to improve sleep efficiency (Irwin et al., 2006).

While results of this meta-analysis suggest that insomnia interventions do not impact rates of alcohol abstinence among individuals with AUD, the methodological weaknesses of the studies included in this review may have limited our ability to detect significant changes in

alcohol use. For example, only six of the nine studies in this review reported alcohol use outcomes; thus, we are unable to determine if other interventions had significant effects on rates of abstinence or relapse. Moreover, in the three behavioral intervention studies that measured alcohol-related outcomes (Arnedt et al., 2011; Chakravorty, Perlis, et al., 2016; Currie et al., 2004), most participants either reported abstinence or were required to abstain from alcohol for approximately one month prior to baseline. These relatively extended periods of pre-treatment abstinence may limit the ability to detect changes in alcohol use, due in part to limited rates of relapse over the course of the study.

The question remains, then, why pharmacological interventions that improved sleep quality did not impact abstinence rates. While some of the pharmacological intervention studies may have been underpowered to detect secondary outcomes, Friedmann and colleagues (2008) were sufficiently powered to detect changes in abstinence as a function of treatment and did document improvements in sleep quality as a result of treatment with trazodone. However, in contrast to hypotheses, they found that participants in the trazodone group reported a smaller increase in abstinent days than those in the placebo group. The authors speculate that the pharmacological properties of trazodone may have induced craving in their participants and, upon cessation, may have induced symptoms of alcohol withdrawal, triggering consumption (Friedmann et al., 2008). However, their sample also consisted of recently detoxified patients, only 25% of whom had engaged in formal substance use treatment by one-month follow-up. It is possible that, without the support of formal treatment, quick alleviation of insomnia symptoms led to a minimization of detoxification and withdrawal symptoms that facilitated alcohol relapse.

Compared to controls, insomnia intervention participants also showed significant decreases in symptoms of depression. While there were no statistically significant differences between behavioral or pharmacological interventions in effects on depressive symptoms, summary effect sizes stratified by group indicated that behavioral intervention participants showed a significant reduction in depressive symptoms relative to controls. Notably, the three behavioral intervention trials that reported depressive symptom outcomes were testing the efficacy of CBT-I. Consistent with previous studies (Clarke et al., 2015; Manber et al., 2008), CBT-I reduced symptoms of depression among individuals with comorbid AUD, with effect sizes ranging from small to large. Given the prevalence of depressive symptoms among patients with AUD (SAMHSA, 2016) and the promise of these findings, additional studies examining the impact of CBT-I on psychiatric outcomes among patients with AUD are warranted.

4.1. Limitations and Future Directions

Findings from this systematic review and meta-analysis fill a gap in the literature by quantifying the impact of various insomnia treatments on sleep- and alcohol-related outcomes. That being said, a number of sample and methodological limitations need to be considered. Definitions of 'insomnia' varied considerably across studies; some trials included AUD participants who complained of sleep disturbance and others required that participants meet diagnostic criteria for both AUD and insomnia disorder. It is unclear to what extent this impacted outcomes, as participants in all studies reported sleep disturbances

above the clinical screening cut-off for insomnia. However, we could be more confident in conclusions regarding the efficacy of insomnia treatment within this population if samples were more consistent across studies.

Future research may also target demographic subgroups that were not fully represented in this review. For example, participants in these studies were not necessarily seeking or engaged in treatment for alcohol use, and they varied in rates of abstinence at baseline. Rates of alcohol relapse may be higher among those in earlier recovery (2 to 4 weeks after detoxification), which is a time of prevalent sleep disturbance (Chakravorty, Chaudhary, et al., 2016). As such, findings may not generalize to those in earlier recovery or those actively seeking treatment. Similarly, three out of four participants were men. While rates of AUD tend to be higher among men (Goldstein et al., 2015), rates of AUD are increasing among women (Han et al., 2017) and the prevalence of insomnia tends to be higher among women (Ford et al., 2015). Thus, women may be an important target for AUD and insomnia interventions in the future.

The studies included in this review were also limited by a number of methodological weaknesses. Eight of the 9 trials had fewer than 30 participants per group at the first follow-up assessment, and authors did not consistently account for attrition and missing data. Moreover, 5 of the 9 studies were limited to post-intervention outcomes. Such sample sizes and follow-up designs are consistent with pilot or developmental work (Rounsaville et al., 2001). Given the promise of these interventions, longitudinal research examining the efficacy of insomnia treatment with larger samples are needed. Finally, only six studies provided outcome data for both sleep quality and alcohol abstinence. Future research would be improved by consistent reporting of both sleep and alcohol use outcomes.

5.0. Conclusions

The co-occurrence of insomnia and AUD is both prevalent and costly. Based on the results of this systematic review and meta-analysis, both behavioral and pharmacological interventions are effective in improving sleep quality among individuals with comorbid AUD, with behavioral interventions demonstrating consistently larger effects. Intervention participants also reported improvements in symptoms of depression following insomnia treatment. Given the small sample sizes and methodological weaknesses of the studies reviewed, additional research is needed to determine the efficacy of insomnia treatment in improving rates of alcohol relapse within this population. Considerations for future research include standardized definitions of insomnia, consistent reporting of both sleep and alcohol use outcomes, inclusion of diverse demographic groups, and fully-powered longitudinal designs.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- The co-occurrence of insomnia and alcohol use disorder (AUD) is prevalent and costly.
- Insomnia treatment improves sleep quality and depression in those with comorbid AUD.
- Behavioral interventions are more efficacious in improving sleep quality.
- Insomnia treatment has not improved rates of alcohol abstinence in studies to date.

Figure 1.
PRISMA flow diagram

Figure 2.

Forest plot for sleep quality at first follow-up assessment ($k = 8$).

Note. Pharmacological intervention studies are highlighted in gray.

Figure 3.

Forest plot for alcohol abstinence at first follow-up assessment ($k = 7$).

Note. Pharmacological intervention studies are highlighted in gray.

Figure 4.

Forest plot for depressive symptoms at first follow-up assessment ($k = 5$).

Note. Pharmacological intervention studies are highlighted in gray.

Table 1

Characteristics of the 9 studies included in the meta-analysis.

Sample characteristics		Arndt (2011)	Brower (2008)	Chakravorty (2014)	Chakravorty (2016)	Currie (2004)	Friedmann (2008)	Greeff (1998)	Karam-Hage (2003)	Le Bon (2003)
<i>N</i> (%)		17 (59)	21 (52)	22 (91)	22 (95)	60 (68)	173 (82)	22 (100)	55 (91)	18 (89)
% Female		35	48	0	0	30	9	0	62	6
Age in years		46	45	53	55	43	41	46	44	44
Place		77% W	76% W	95% B	NR	NR	86% W	NR	84% W	NR
Sleep inclusion		Diagnosis	Diagnosis	Complaint	Complaint	Diagnosis	Complaint	Diagnosis	Diagnosis	Diagnosis
Intervention details										
Intervention		CBT-I	Gabapentin	Quetiapine	CBT-I	CBT-I	Trazodone	PMR	Gabapentin	Trazodone
Frequency/dose and duration		8 sessions (weekly)	1500mg (42 days)	400 mg (56 days)	8 sessions (weekly)	5 sessions (weekly)	50–150mg (84 days)	10 sessions (2 weeks)	300–1800mg (28–42 days)	150–200mg (28 days)
Sleep medication			X	X			X		X	X
Sleep education		X			X	X	X			
Sleep restriction		X			X	X				
Stimulus control		X			X	X				
Cognitive therapy		X			X	X				
Relaxation training								X		
Alcohol education		X								
Control condition		RCM	Placebo	Placebo	AO	RCM	Placebo	AO	Trazodone (50–300mg)	Placebo
Measures										
Sleep problems		Diary, ISI [†]	SPQ	ISI, PSQI [†]	ISI	PSQI	PSQI	Unpublished	SPQ	--
Alcohol abstinence		TLFB	TLFB	TLFB	TLFB	TLFB	TLFB	--	Unknown	--
Depression		BDI	--	PHQ-9	QIDS	BDI	--	--	--	HRSD
Follow-ups		Post	Post 6wk	Post	Post 3mo 6mo	Post 3mo 6mo	1mo Post (3mo) 6mo	Post	Post	Post

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	Arndt (2011)	Brower (2008)	Chakravorty (2014)	Chakravorty (2016)	Currie (2004)	Friedmann (2008)	Greeff (1998)	Karam-Hage (2003)	Le Bon (2003)
Total MQ Score (%)	8 (50%)	12 (75%)	10 (63%)	9 (56%)	13 (81%)	14 (88%)	7 (44%)	4 (31%)	11 (69%)

Note: Pharmacological intervention studies are highlighted in gray.

[†] average used in analyses.

AO = assessment only. BDI = Beck Depression Inventory. CBT-I = Cognitive Behavioral Therapy for Insomnia. Diary = daily sleep diary. HRS = Hamilton Rating Scale for Depression. ISI = Insomnia Severity Index. Mo = month. MQ = methodological quality (range 0–16). N (%) = number of participants who consented to participate (% retention). PHQ = Patient Health Questionnaire. PMR = Progressive Muscle Relaxation. QIDS = Quick Inventory of Depressive Symptoms. RCM = relevant content matched for time. SPQ = Sleep Problems Questionnaire. TLFB = Timeline Follow-back. X = included in the intervention.