# Cognitive Behavioral Therapy for Insomnia: A Review of Efficacy, Durability, and Mental Health Outcomes

Rowan Albritton

Vida Lab

2026

## Abstract

Chronic insomnia is among the most common health complaints in adulthood and is consistently more prevalent in women than in men, yet it is still frequently managed with hypnotic medication rather than with the treatment that major clinical guidelines recommend first. This review synthesizes clinical practice guidelines, systematic reviews, meta-analyses, and large randomized controlled trials to evaluate cognitive behavioral therapy for insomnia (CBT-I) as a first-line intervention. The research question posed is whether CBT-I produces clinically meaningful, durable improvements in sleep that extend to daytime functioning and mental health, and whether those benefits hold across delivery formats and age groups. The evidence indicates that multicomponent CBT-I improves sleep onset latency, wake after sleep onset, and sleep efficiency in adults, that its benefits appear to outlast those of hypnotic medication, and that its effects in routine clinical care closely match those observed in controlled efficacy trials. Fully automated digital programs extend these benefits at scale, and large trials link improved sleep to modest reductions in paranoia, hallucinatory experiences, and incident depression. Evidence in adolescents is encouraging but rests on small samples and mainly subjective outcomes, and the possibility that early CBT-I prevents acute insomnia from becoming chronic remains preliminary. This review argues that CBT-I is best understood not as a sleep hygiene program but as a targeted treatment for the learned hyperarousal that sustains insomnia, and that its underuse reflects problems of access rather than of evidence.

*Keywords:* insomnia, cognitive behavioral therapy, CBT-I, sleep, digital therapeutics, depression, adolescents, hyperarousal

# Cognitive Behavioral Therapy for Insomnia: A Review of Efficacy, Durability, and Mental Health Outcomes

## Introduction

In 2016, the American College of Physicians issued a recommendation that is still unusual in its directness: every adult with chronic insomnia disorder should receive cognitive behavioral therapy for insomnia (CBT-I) as the initial treatment, with medication considered only when that therapy has not worked (Qaseem et al., 2016). The recommendation was graded as strong and was built on moderate-quality evidence, and it placed a structured psychological treatment ahead of the sleeping pills that had long dominated the management of insomnia. Nearly a decade later, the American Academy of Sleep Medicine and the European Sleep Research Society have reached the same conclusion through independent systematic reviews (Edinger et al., 2021; Riemann et al., 2023). The consensus is notable because insomnia is often treated as a minor complaint, something to be managed with a supplement, a nightly routine, or a short prescription, rather than as a disorder with its own maintaining mechanisms and its own evidence-based treatment.

The question is not merely academic. Insomnia is unevenly distributed across the population. Bin Zhang and Yun-Kwok Wing, researchers in the Department of Psychiatry at the Chinese University of Hong Kong, pooled 29 epidemiological studies covering more than 1.2 million participants and found that women had a 41 percent higher risk of insomnia than men (risk ratio 1.41, 95% CI 1.28 to 1.55), with the female excess present across age groups and growing larger with age (Zhang & Wing, 2006). For an educational platform focused on the health of girls and young women, the treatment of insomnia is therefore a question with direct relevance to its audience, and it connects sleep to the broader fields of brain health and

mental health in ways that recent trials have begun to make concrete.

Accordingly, the research question posed is: does CBT-I produce clinically meaningful and durable improvements in sleep, do those improvements extend to daytime functioning and mental health, and do the benefits hold when the treatment is delivered digitally, in routine care, and to younger populations? This review examines the theoretical rationale for CBT-I, its efficacy and durability relative to medication, the evidence for digital delivery, its emerging links to mental health outcomes, and the more limited evidence in adolescents. It argues that CBT-I is the best-supported treatment for chronic insomnia because it targets the learned hyperarousal that maintains the disorder, and that the principal barrier to its use is access rather than any weakness in the evidence base.

## Insomnia as Hyperarousal

Understanding why a behavioral treatment can outperform a sedative requires understanding what insomnia is thought to be. Dieter Riemann and colleagues at the Freiburg University Medical Center reviewed autonomic, neuroendocrine, neuroimmunological, electrophysiological, and neuroimaging studies and concluded that people with primary insomnia show elevated arousal not only at night but also during the day (Riemann et al., 2010). This finding matters because it reframes insomnia as a state of excessive activation rather than as a simple deficit of sleepiness. A person with chronic insomnia is often tired but unable to sleep, and the hyperarousal model offers a physiological account of that paradox.

Riemann et al. (2010) further proposed that insomnia functions as a final common pathway shaped by three interacting forces: a genetic vulnerability toward an imbalance between arousing and sleep-inducing brain activity, psychosocial or medical stressors, and

perpetuating mechanisms that include dysfunctional sleep-related behavior, learned associations between the bed and wakefulness, and a tendency to worry or ruminate. The last category is the most clinically important, because it is the one that can be changed. A stressful week may trigger poor sleep in almost anyone, but the habits that follow, such as spending longer in bed to recover lost sleep, lying awake while monitoring the clock, or worrying about the next day's performance, can turn a temporary disruption into a self-sustaining disorder.

CBT-I is designed around those perpetuating factors. In the trials pooled by Trauer et al. (2015), multicomponent CBT-I combined at least three of five elements: cognitive therapy, stimulus control, sleep restriction, sleep hygiene, and relaxation. In standard clinical descriptions, stimulus control aims to re-establish the bed as a cue for sleep rather than for wakefulness, sleep restriction temporarily limits time in bed to consolidate sleep and build sleep drive, and cognitive therapy addresses inaccurate or catastrophic beliefs about sleep. Read alongside the hyperarousal model, these components can be interpreted as a direct attack on the learned and cognitive processes that keep arousal high at bedtime. This interpretation is a theoretical link rather than a demonstrated mechanism for every patient, but it helps explain a consistent pattern in the guideline literature: the components that change behavior and cognition carry stronger recommendations than general advice about healthy sleep habits.

## Efficacy and Durability

The most frequently cited estimate of CBT-I's efficacy comes from James Trauer and colleagues, who conducted a systematic review and meta-analysis of 20 randomized controlled trials comprising 1,162 adults with chronic insomnia, 64 percent of whom were female, with a mean age of 56 years (Trauer et al., 2015). Compared with inactive control conditions, face-to-face multicomponent CBT-I shortened sleep onset latency by about 19 minutes,

reduced wake after sleep onset by about 26 minutes, and improved sleep efficiency by nearly 10 percentage points at the end of treatment, with changes that appeared to be sustained at later time points. Total sleep time increased by only about 7.6 minutes, and the confidence interval for that estimate crossed zero. This pattern is instructive. CBT-I appears to make sleep faster to begin and more continuous rather than dramatically longer in the short term, which is consistent with a treatment that consolidates sleep before extending it. No adverse outcomes were reported in the included trials, although the authors noted that their exclusion of insomnia with medical or psychiatric comorbidity limited how far the estimates could be generalized.

The relationship between CBT-I and medication is central to the guideline recommendations. Matthew Mitchell and colleagues at the Center for Evidence-based Practice at the University of Pennsylvania Health System systematically reviewed randomized trials that compared CBT-I directly with prescription or non-prescription medication (Mitchell et al., 2012). Only five studies met their criteria, but the pattern was clear enough to be clinically useful: low- to moderate-grade evidence suggested that CBT-I was more effective than benzodiazepine and non-benzodiazepine hypnotics over the long term, while very low-grade evidence suggested that benzodiazepines worked better in the short term. In other words, medication may act faster, but the benefits of CBT-I appear more durable. This trade-off explains why the guidelines do not dismiss medication entirely; rather, they place it in a supporting role.

The guidelines themselves reflect this balance. The American Academy of Sleep Medicine task force led by Jack Edinger, affiliated with National Jewish Health and Duke University Medical Center, issued a strong recommendation for multicomponent CBT-I and conditional recommendations for brief multicomponent therapies, stimulus control, sleep restriction, and relaxation therapy used alone (Edinger et al., 2021). Notably, the same

guideline suggested that clinicians not use sleep hygiene education as a single-component treatment. Correspondingly, the 2023 European Insomnia Guideline, led by Riemann from the University of Freiburg, recommended CBT-I as first-line treatment for adults of any age, including those with comorbid conditions, whether delivered in person or digitally, and reserved pharmacological treatment for cases in which CBT-I is not sufficiently effective (Riemann et al., 2023). The European guideline limited benzodiazepines, benzodiazepine receptor agonists, and low-dose sedating antidepressants to short-term use of four weeks or less in most cases, allowed orexin receptor antagonists for up to three months or longer in some cases, and recommended against antihistamines, antipsychotics, fast-release melatonin, ramelteon, and herbal remedies for insomnia. The distinction between sleep hygiene and CBT-I is perhaps the most practically important point in this literature, since generic advice about caffeine and screens is often mistaken for the treatment itself.

A persistent concern with any psychological therapy is that results achieved in research settings may not survive the transition to ordinary clinical practice, where therapists are less specialized and patients more complex. Lars-Göran Öst of Stockholm University and colleagues addressed this directly in a meta-analysis of 32 studies and 5,231 adults treated with CBT for insomnia disorder in routine clinical care (Öst et al., 2025). Within-group effect sizes for insomnia severity were very large at the end of treatment (Hedges' g = 1.87) and at follow-up an average of 12 months later (g = 1.68), remission rates were 45 percent after treatment and 51 percent at follow-up, and attrition was 13.9 percent. Most importantly, a benchmarking analysis found that effectiveness studies conducted in routine care produced almost exactly the same effect size as controlled efficacy trials (1.83 compared with 1.82). Within-group effects lack a control condition and will overstate what is attributable to treatment alone, and the authors judged the risk of bias to be considerable in most included studies. Even so, the close agreement between routine and research settings answers one of the

most common objections to scaling CBT-I.

## Digital Delivery and Reach

If CBT-I is effective and durable, the obvious question is why it is not the default treatment in practice. Access is one plausible answer, since face-to-face CBT-I requires a trained clinician and several sessions, and digital delivery has emerged as a leading attempt to widen it. Colin Espie, of the Sleep and Circadian Neuroscience Institute at the University of Oxford, and colleagues randomized 1,711 adults with self-reported insomnia symptoms to a fully automated digital CBT-I program or to sleep hygiene education delivered through a website and booklet (Espie et al., 2019). The sample was 77.7 percent female, with a mean age of 48 years. At 24 weeks, digital CBT-I produced a small improvement in functional health and psychological well-being and a large improvement in sleep-related quality of life, and statistical mediation analysis indicated that reductions in insomnia accounted for between 45.5 and 84.0 percent of these effects. This trial is significant because it measured outcomes people actually care about, namely how they function during the day, rather than sleep parameters alone. It should be noted that Espie is also affiliated with Big Health Ltd, the company that develops the digital program tested, and that 91.1 percent of participants were white, which limits generalization.

The 2023 European guideline's explicit endorsement of digital delivery reflects this growing evidence base (Riemann et al., 2023). Digital CBT-I does not resolve every problem of access, since it requires reliable internet access, a degree of health literacy, and the motivation to complete a structured program without a therapist. Nevertheless, it changes the scale at which the treatment can be offered, which in turn makes it possible to test questions that would be impractical with face-to-face therapy alone, including whether treating sleep can

change mental health outcomes in large populations.

## Sleep and Mental Health

Insomnia frequently co-occurs with depression, anxiety, and other psychiatric conditions, and it has traditionally been treated as a symptom of those disorders. The OASIS trial, led by Daniel Freeman of the Department of Psychiatry at the University of Oxford, tested a different possibility: that disrupted sleep is itself a contributing cause of mental health problems (Freeman et al., 2017). The trial randomized 3,755 university students with insomnia across 26 UK universities to digital CBT-I or usual care. At 10 weeks, the intervention produced a large reduction in insomnia (Cohen's d = 1.11) and smaller but statistically significant reductions in paranoia (d = 0.19) and hallucinatory experiences (d = 0.24), and the change in insomnia statistically mediated the change in those psychotic experiences. Because the trial randomized the sleep intervention, it provides stronger evidence than observational research that improving sleep can reduce these experiences. The authors interpreted the findings as strong evidence that insomnia is a causal factor in psychotic experiences, although they also noted that generalization beyond a student population requires testing, and the effects on paranoia and hallucinations, while statistically robust, were modest in size and measured by online self-report.

Similarly, Michael Irwin and colleagues at the Cousins Center for Psychoneuroimmunology at the University of California, Los Angeles, asked whether treating insomnia could prevent depression in older adults, a group at elevated risk of both conditions (Irwin et al., 2022). They randomized 291 adults aged 60 or older with insomnia disorder and no current major depression to two months of CBT-I or to an active comparator, sleep education therapy. Over up to 36 months of follow-up, incident or recurrent major depression

occurred in 12.2 percent of the CBT-I group and 25.9 percent of the comparison group (hazard ratio 0.51, 95% CI 0.29 to 0.88). Participants in the CBT-I group whose insomnia remained in sustained remission had an 82.6 percent lower likelihood of depression than comparison participants without sustained remission. The use of an active comparator strengthens the conclusion, because it controls for attention and education about sleep. However, follow-up completion at 24 months was lower in the CBT-I group than in the comparison group (73.1 percent compared with 86.7 percent), and the study was conducted at a single site, so replication in larger and more diverse populations is needed.

Taken together, these trials move the conversation about sleep and mental health from association toward intervention. They do not show that every case of depression or psychosis is caused by poor sleep, and they do not establish CBT-I as a treatment for those disorders. What they do suggest is that insomnia is a modifiable factor, and that treating it may reduce the burden of other conditions. This is a meaningful shift for the field of brain health, in which sleep is increasingly understood as an active contributor to mental well-being rather than a passive reflection of it.

## Adolescents and Young Adults

The evidence base for CBT-I was built largely in middle-aged and older adults, yet sleep problems often begin earlier. Zhengyang Mei and colleagues at Southwest University in Chongqing conducted a meta-analysis of eight randomized controlled trials including 599 adolescents (Mei et al., 2024). After treatment, CBT-I produced a large improvement in insomnia severity (standardized mean difference -1.06) along with improvements in sleep onset latency, total sleep time, and sleep efficiency, and the improvement in insomnia remained significant at follow-up (standardized mean difference -0.79). These are encouraging

results, although eight trials and fewer than 600 participants represent a small evidence base compared with the adult literature.

Schools offer one possible route to reaching adolescents who would never seek out a sleep clinic. Catriona Ewart and colleagues at the Strathclyde Sleep Centre at the University of Strathclyde reviewed eight studies of school-based CBT-I involving 323 adolescents with a mean age of 15.3 years, 62.57 percent of whom were female (Ewart et al., 2025). Within the intervention groups, self-reported total sleep time increased by about 24 minutes and sleep onset latency decreased by about 8 minutes, and anxiety improved significantly. However, objectively measured sleep did not change significantly, and depression did not improve. The divergence between subjective and objective outcomes is a recurring theme in insomnia research and does not necessarily mean the subjective improvements are illusory, since insomnia is defined partly by the experience of poor sleep. It does mean that the evidence for school-based programs should be considered preliminary, and the authors themselves emphasized the methodological limitations of the available studies.

Moreover, the sex difference in insomnia identified by Zhang and Wing (2006) suggests that young women in particular stand to benefit from accessible, evidence-based treatment. Notably, the participants in several of the major trials reviewed here were predominantly female, including 64 percent of participants in the meta-analysis by Trauer et al. (2015) and 77.7 percent in the trial by Espie et al. (2019). This means that the core evidence for CBT-I is, if anything, weighted toward women. What remains less clear is whether hormonal transitions across the lifespan, such as puberty, pregnancy, and the menopausal transition, modify how women respond to treatment, a question that the studies reviewed here were not designed to answer.

## Evidence, Uncertainty, and Gaps

The current evidence firmly supports several conclusions. Multicomponent CBT-I improves sleep onset, sleep continuity, and sleep efficiency in adults with chronic insomnia (Trauer et al., 2015); its benefits appear more durable than those of hypnotic medication (Mitchell et al., 2012); it is recommended as first-line treatment by three major guideline bodies (Edinger et al., 2021; Qaseem et al., 2016; Riemann et al., 2023); and its effects in routine clinical care closely match its effects in controlled trials (Öst et al., 2025). Digital delivery is supported by large randomized trials and by guideline endorsement (Espie et al., 2019; Riemann et al., 2023). Equally well supported is the negative finding that sleep hygiene education alone is not an adequate substitute for CBT-I (Edinger et al., 2021).

Other findings are promising but should be regarded as preliminary. The reductions in paranoia, hallucinatory experiences, and incident depression observed after CBT-I come from a small number of large but population-specific trials, one in university students and one in older adults at a single site (Freeman et al., 2017; Irwin et al., 2022). Evidence in adolescents rests on small samples, and school-based programs have so far demonstrated improvements mainly in self-reported rather than objectively measured sleep (Ewart et al., 2025; Mei et al., 2024). Similarly, Douglas Barroso and colleagues at the State University of Santa Cruz in Brazil found, in a meta-analysis of four randomized trials and 327 patients with acute insomnia of less than six months' duration, that brief CBT-I reduced insomnia severity and roughly halved the incidence of progression to chronic insomnia (reported ratio 0.50, 95% CI 0.35 to 0.70) (Barroso et al., 2024). The authors described this as preliminary evidence and called for larger trials, but if confirmed, it would shift CBT-I from a treatment for established disorder toward early prevention.

Several important questions remain unresolved. The precise mechanisms through which CBT-I works, and whether it measurably reduces the physiological markers of hyperarousal described by Riemann et al. (2010), are not established by the trials reviewed here. Long-term outcomes beyond one to three years are less well characterized. The participants in the largest digital trial were overwhelmingly white (Espie et al., 2019), and evidence across racial, socioeconomic, and cultural groups remains thin. Finally, the question of who does not respond deserves more attention: even in routine care, roughly half of patients were not in remission at follow-up (Öst et al., 2025), and identifying those patients early, and determining what they need instead, is a necessary next step for the field.

## Conclusion

This review set out to determine whether CBT-I produces meaningful, durable improvements in sleep that extend to daytime functioning and mental health, and whether those benefits hold across delivery formats and age groups. The evidence reviewed supports the thesis that CBT-I is the best-supported treatment for chronic insomnia in adults. It improves sleep onset and continuity, its benefits appear to outlast those of medication, it performs in routine clinical care much as it does in research trials, and it can be delivered digitally at scale with measurable gains in daytime functioning. These findings are consistent with the hyperarousal model of insomnia, in which learned behaviors and cognitive patterns sustain a state of excessive activation that a sedative may temporarily override but does not unlearn.

The evidence is less settled at the boundaries. The links between treating insomnia and reducing paranoia, hallucinatory experiences, and depression are supported by randomized trials but remain modest in size and limited to particular populations. Evidence in adolescents

is encouraging but small, and the possibility that brief CBT-I prevents acute insomnia from becoming chronic is still preliminary. These open questions do not weaken the case for CBT-I as first-line care; rather, they define where research should go next. The more pressing gap is practical: a treatment that three major guideline bodies recommend first remains difficult for many people to access. Closing that gap through digital programs, school-based delivery, and better training for clinicians is likely to matter as much for public health as any further trial of efficacy.

This paper is educational and does not offer medical advice. Vida Lab is educational and does not diagnose.

## References

Barroso, D., Hespanhol, L., Siegloch, M. L., Romeiro, P., Silva, C., Costa, I., Garbacka, A., Filho, A. V. T., & Kay, D. B. (2024). Effect of minimal cognitive behavioral therapy for patients with acute insomnia: A systematic review and meta-analysis. *Sleep Medicine, 122*, 171–176. https://doi.org/10.1016/j.sleep.2024.08.003

Edinger, J. D., Arnedt, J. T., Bertisch, S. M., Carney, C. E., Harrington, J. J., Lichstein, K. L., Sateia, M. J., Troxel, W. M., Zhou, E. S., Kazmi, U., Heald, J. L., & Martin, J. L. (2021). Behavioral and psychological treatments for chronic insomnia disorder in adults: An American Academy of Sleep Medicine clinical practice guideline. *Journal of Clinical Sleep Medicine*, *17*(2), 255–262. https://doi.org/10.5664/jcsm.8986

Espie, C. A., Emsley, R., Kyle, S. D., Gordon, C., Drake, C. L., Siriwardena, A. N., Cape, J., Ong, J. C., Sheaves, B., Foster, R., Freeman, D., Costa-Font, J., Marsden, A., & Luik, A. I. (2019). Effect of digital cognitive behavioral therapy for insomnia on health, psychological well-being, and sleep-related quality of life: A randomized clinical trial. *JAMA Psychiatry*, *76*(1), 21–30. https://doi.org/10.1001/jamapsychiatry.2018.2745

Ewart, C., Egan, K. J., Henderson, M., McCrory, S., & Fleming, L. (2025). Evaluating the effectiveness of cognitive behavioral therapy for insomnia in school settings: A systematic review and meta-analysis. *Behavioral Sleep Medicine*, *23*(6), 719–738. https://doi.org/10.1080/15402002.2025.2529856

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., . . . Espie, C. A. (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

Irwin, M. R., Carrillo, C., Sadeghi, N., Bjurstrom, M. F., Breen, E. C., & Olmstead, R. (2022). Prevention of incident and recurrent major depression in older adults with insomnia: A randomized clinical trial. *JAMA Psychiatry*, *79*(1), 33–41. https://doi.org/10.1001/jamapsychiatry.2021.3422

Mei, Z., Cai, C., Luo, S., Zhang, Y., Lam, C., & Luo, S. (2024). The efficacy of cognitive behavioral therapy for insomnia in adolescents: A systematic review and meta-analysis of randomized controlled trials. *Frontiers in Public Health, 12*, Article 1413694. https://doi.org/10.3389/fpubh.2024.1413694

Mitchell, M. D., Gehrman, P., Perlis, M., & Umscheid, C. A. (2012). Comparative effectiveness of cognitive behavioral therapy for insomnia: A systematic review. *BMC Family Practice*, *13*, Article 40. https://doi.org/10.1186/1471-2296-13-40

Öst, L.-G., Brattmyr, M., Enebrink, P., Finnes, A., Ghaderi, A., Hansdottir, I., Havnen, A., Njardvik, U., Salomonsson, S., & Wergeland, G. J. (2025). Cognitive behavioral therapy for adult insomnia disorder in routine clinical care: A systematic review and meta-analysis. *Cognitive Behaviour Therapy*. Advance online publication. https://doi.org/10.1080/16506073.2025.2588173

Qaseem, A., Kansagara, D., Forciea, M. A., Cooke, M., Denberg, T. D., & Clinical Guidelines Committee of the American College of Physicians. (2016). Management of chronic insomnia disorder in adults: A clinical practice guideline from the American College of Physicians. *Annals of Internal Medicine, 165*(2), 125–133. https://doi.org/10.7326/M15-2175

Riemann, D., Espie, C. A., Altena, E., Arnardottir, E. S., Baglioni, C., Bassetti, C. L. A., Bastien, C., Berzina, N., Bjorvatn, B., Dikeos, D., Dolenc Groselj, L., Ellis, J. G., Garcia-Borreguero, D., Geoffroy, P. A., Gjerstad, M., Gonçalves, M., Hertenstein, E., Hoedlmoser, K., Hion, T., . . . Spiegelhalder, K. (2023). The European Insomnia Guideline: An update on the diagnosis and treatment of insomnia 2023. *Journal of Sleep Research, 32*(6), Article e14035. https://doi.org/10.1111/jsr.14035

Riemann, D., Spiegelhalder, K., Feige, B., Voderholzer, U., Berger, M., Perlis, M., & Nissen, C. (2010). The hyperarousal model of insomnia: A review of the concept and its evidence. *Sleep Medicine Reviews*, *14*(1), 19–31. https://doi.org/10.1016/j.smrv.2009.04.002

Trauer, J. M., Qian, M. Y., Doyle, J. S., Rajaratnam, S. M. W., & Cunnington, D. (2015). Cognitive behavioral therapy for chronic insomnia: A systematic review and meta-analysis. *Annals of Internal Medicine, 163*(3), 191–204. https://doi.org/10.7326/M14-2841

Zhang, B., & Wing, Y.-K. (2006). Sex differences in insomnia: A meta-analysis. *Sleep*, *29*(1), 85–93. https://doi.org/10.1093/sleep/29.1.85