

Doctor of Medical Science

Background

- Insomnia is considered the most prevalent sleep disorder, with up to 30% of the general population afflicted chronically.
- Continues to be under-recognized and untreated. Left untreated, it could increase the risk of mental health and physical disorders
- While numerous studies demonstrate the effectiveness of cognitive behavioral therapy for insomnia (CBTi), barriers to its use persist (lack of trained personnel, equitable access, and affordability)
- Alternative delivery methods including online CBTi have been evaluated to address these barriers.

Purpose

Evaluate and quantify the most current evidence for online CBTi as a treatment for chronic adult insomnia

Methods

- EBSCO MEDLINE[®], CINAHL[®], Ovid MEDLINE[®], PsycINFO[®], Ovid EMCARE, and PubMed[®]
- Inclusion criteria: randomized trials, adults with chronic insomnia, compared online CBTi to at least one control, Insomnia Severity Index or the Sleep Condition Indicator as measurement tool
- Exclusion criteria: insomnia not primary diagnosis, primary intervention not online/web-based form of CBTi, significant mental or physical health disorders, and specific populations (pregnant, shift workers, or unstable sleep apnea)
- Primary outcomes: insomnia severity (IS), sleep efficiency (SE)
- Secondary outcomes: wake after sleep onset (WASO), sleep onset latency (SOL), total sleep time (TST), nocturnal awakenings (NWAK)
- PRISMA checklist and Cochrane Risk of Bias for quality/bias assessment per study
- Review Manager (RevMan) 5.3, Number Cruncher Statistical System (NCSS), *Meta-Essentia*l excel add-in
- Between group and pooled effects calculated under a randomeffects model using standardized mean differences for effect sizes (ES). Hedges' g applied to correct small sample bias
- ES values of 0.2, 0.5, and 0.8 were used to represent small, medium, and large effects, respectively
- Heterogeneity measured with I² percentages of 25%, 50%, and 75% considered low, moderate, and high heterogeneity, respectively.
- Publication bias assessed with funnel plots, Duval and Tweedie's trim and fill method, Egger's Regression model, Begg and Mazumdar's test



Assessing the Effectiveness of Online Cognitive Behavioral Therapy in Adults with Chronic Insomnia: A Systematic Review and Meta-Analysis

Analysis

	Std. Mean Difference			
Study or Subgroup	IV, Random, 95% CI			
5.1.1 Online CBTi vs In	active Control			
Espie 2012	-1.14 [-1.54, -0.73]			
Espie 2018	-0.91 [-1.01, -0.81]			
Freeman 2016	-0.71 [-0.79, -0.63]			
Hagatun 2017	-1.39 [-1.76, -1.02]			
Lancee 2015	-0.69 [-1.20, -0.17]			
Lancee 2016	-0.88 [-1.41, -0.35]			
Lorenz 2018	-0.95 [-1.52, -0.37]			
Ritterband 2009	-2.08 [-2.83, -1.34]			
Ritterband 2017	-0.97 [-1.22, -0.72]			
Taylor 2014	-1.14 [-1.92, -0.35]			
Taylor 2017	-0.59 [-1.08, -0.10]			
Thiart 2015	-1.44 [-1.83, -1.05]	-		
Subtotal (05% CI)	-0.81 [-1.19, -0.44]			
	-0.35 [-1.15, -0.04]			
Test for sucrell offect: 7	0.04, CHE = 45.76, 0I = 12 (P < 0.00001), F = 74%			
restion overall ellect. 2	$L = 12.40 (P \le 0.00001)$			
5.1.2 Online CBTi vs A	ctive Placebo			
Espie 2012	-0.84 [-1.230.45]			
Kaldo 2015	-0.82 [-1.16, -0.48]			
Pillai 2015	-0.90 [-1.80, -0.00]	-		
Subtotal (95% CI)	-0.83 [-1.08, -0.59]			
Heterogeneity: Tau ² = I	0.00; Chi² = 0.03, df = 2 (P = 0.98); l² = 0%			
Test for overall effect: 2	Z = 6.65 (P ≤ 0.00001)			
5.1.3 Online CBTLVs F	IF or Telehealth			
Blom 2015	0.25 [-0.32, 0.82]			
Holmqvist 2014	0.30 [-0.16, 0.77]			
Lancee 2016	1.16 [0.61, 1.71]			
Laylor 2017 Subtotal (95% CI)	0.49 [0.01, 0.98]			
	0.54 [0.15, 0.95]			
Toot for everall effect: 7	0.09, CHE = 0.92, UI = 3 (P = 0.07), F = 57%			
Test for overall effect. 2	L = 2.73 (P = 0.006)			
		-2		
		Favours C		
igure 3 Between Crew	Effects Incompia Soverity			
igure 2. Between-Group	Effects, insomnia Severity			

	Std. Mean Difference						
	Study or Subgroup						
	6.1.1 Online CBTi vs I						
	Espie 2012						
	Hagatun 2017	1.28 [0.88, 1.68]					
	Lancee 2012 0.61 [0.41, 0.81]						
	Lancee 2015 1.09 [0.55, 1.62]						
	Lancee 2016 0.38 (-0.13, 0.89)						
	Ritterband 2009 1.21 [0.56, 1.86]						
	Ritterband 2017	0.65 [0.41, 0.89]					
	Ström 2004 0.19 [-0.26, 0.65]						
	Taylor 2014	1.12 [0.34, 1.90]					
	Taylor 2017	0.50 [0.01, 0.99]					
	Thiart 2015	0.47 [0.12, 0.82]					
	van Straten 2014	0.94 [0.56, 1.33]					
	Vincent 2009	0.22 [-0.14, 0.59]					
	Subtotal (95% CI)						
	Heterogeneity: Tau ² = 0.08; Chi ² = 39.30, df = 12 (P < 0.0001); I ² = 69%						
	lest for overall effect:						
	6.1.2 Online CBTi vs A						
	Espie 2012						
	Kaldo 2015	0.67 [0.34, 1.01]					
	Subtotal (95% CI) 0.78 [0.53, 1.03]						
	Heterogeneity: Tau ² = 0.00; Chi ² = 0.92, df = 1 (P = 0.34); I ² = 0%						
	Test for overall effect: Z = 6.00 (P < 0.00001)						
	Diam 2016						
	Biom 2015	0.19[-0.37, 0.76]					
	Holmqvist 2014	0.06 [-0.40, 0.52]					
	Taular 2016	-0.71 [-1.23, -0.19]					
	Subtotal (95% CI)	-0.40 [-0.89, 0.08] -0.22 [-0.62, 0.18]					
	Heterogeneity: Tau ² =						
	Therefore the set of the theory $(1 - 7.42, 4) = 3(1 - 0.00), 1 - 0.00$						
			— <u>t</u>				
			-4				

Figure 3. Between-Group Effects, Sleep Efficiency

Table 1. Pooled Effects, Primary and Secondary Outcomes

Outcome	N _c	Effect Size (95% CI), P	l² (P)	
Insomnia severity (IS)	5726	-0.75 (-0.96, -0.55), <i>P</i> < 0.00001	88% (<i>P</i> < 0.00001)	
Sleep efficiency (SE)	1880	0.66 (0.48, 0.84), <i>P</i> < 0.00001	69% (<i>P</i> < 0.00001)	
Sleep onset latency (SOL)	1774	-0.41 (-0.59, -0.24), <i>P</i> < 0.00001	65% (<i>P</i> = 0.0002)	
Total sleep time (TST)	1774	0.21 (0.07, 0.35), <i>P</i> = 0.004	49% (<i>P</i> = 0.01)	
Wake after sleep onset (WASO)	1440	-0.34 (-0.58, -0.10), <i>P</i> = 0.006	78% (<i>P</i> < 0.00001)	
Nocturnal awakenings (NWAK)	1329	-0.28 (-0.44, -0.12), <i>P</i> = 0.0008	46% (<i>P</i> = 0.05)	

Figure 1. PRISMA Flow Diagram

Lucy A. Bowen, DMSc, PA-C





Results

- Twenty randomized trials involving 7690 participants (72% female, mean age 41.4) met inclusion criteria
- Online CBTi comparison to inactive controls (IC), active controls/placebo (AC/PL), and face-to-face/telehealth (FTF/TH)
- Primary outcomes: between-group effects favored online CBTi over IC and AC/PL. Pooled effects favored online CBTi over all control groups while indicating larger, significant intervention effects in favor of online CBTi for IS and SE. Secondary outcomes: small to moderate significant effects were found for SOL, TST, WASO, and NWAK in favor of online CBTi
- Moderate-high heterogeneity, possible multiple-study and citation bias

Table 2. Study Characteristics

Author	Mean Age	N (% F)	Randomized (% dropout)	Duration (weeks)	Post-assess. ^a (wk)/ follow- up ^b (month)	Control
Blom et al	54.4	23 (48%)	48 (2%)	8	8/6	FTF ^c
Espie et al	49.0	120 (73.2%)	164 (14%)	6	8/2	WL ^d , PL ^e
Espie et al	48.0	1329 (77.7%)	1711 (41%)	8	8/2	SHE ^f
Freeman et al	24.7	2676 (71.3%)	3755 (50%)	6	10/5.5	TAU ^g
Hagatun et al	44.9	122 (67%)	181 (21.6%)	6-9	11/6	SHE
Holmqvist et al	nr	55 (75%)	73 (26%)	6	6/2	TH ^h
Kaldo et al	48.0	116 (78%)	148 (10.14%)	8	8/6, 12, 36	AC ⁱ
Lancee et al	52.1	283 (68.4%)	414 (15.78%)	6	10/6, 12	WL
Lancee et al	48.7	50 (79%)	63 (13%)	6	12/3,6	WL
Lancee et al	41.6	73 (81.11%)	90 (15%)	6	12	WL, FTF
Lorenz et al	42.9	39 (69.64%)	56 (<1%)	6	6/12	WL
Pillai et al	48.6	14 (62.5%)	32 (18.8%)	6	7/nr	AC
Ritterband et al	45.0	34 (76%)	45 (4%)	9	11/6	WL
Ritterband et al	43.3	218 (71.9%)	303 (9.2%)	9	9/6, 12	SHE, FTF
Strom et al	45.0	82 (75.2%)	109 (24%)	5	7/nr	WL
Taylor et al	19.7	14 (58.8%)	34 (14.7%)	6	6/3	WL
Taylor et al	32.7	17 (17%)	100 (14%)	6	6/6	WL
Thiart et al	48.0	95 (74%)	128 (7.8%)	6	8/4	WL
van Straten et al	49.5	83 (70.3%)	118 (17%)	6	6/2	WL
Vincent et al	nr	79 (67%)	118 (33%)	5	5/1	WL

^cface-to-face (FTF); ^dwaitlist (WL); ^eplacebo (PL); ^fsleep hygiene (SHE); ^gtreatment as usual (TAU); ^htelehealth (TH); ⁱactive control (AC); female: F; not reported: nr.

Clinical Prevalence

- Face-to-face treatment may not be as critical for improving sleep outcomes as previously suggested in literature
- Online CBTi appears to be an acceptable alternative, cost-effective treatment for chronic adult insomnia or adjunctive therapy to compliment face-to-face treatment
- Decrease barriers to care
- Increased opportunities for Physician Assistants

Future Research

- Larger studies directly comparing online CBTi with FTF treatments
- Long-term effects of online interventions
- Access-to-care, quality, cost effectiveness, and patient outcomes from online-guided CBTi provided by Physician Assistants

References

- Roth T. Insomnia: Definition, Prevalence, Etiology, and Consequences. J Clin Sleep Med. 2007;3(5 Suppl):S7-S10.
 Fortier-Brochu E, Morin CM. Cognitive impairment in individuals with insomnia: clinical significance and correlates. Sleep. 2014;37(11):1787-98
- 3. Qaseem A, Kansagara D, Forciea MA, Cooke M, Denberg TD. Management of Chronic Insomnia Disorder in Adults: A Clinical Practice Guideline from the American College of Physicians. *Ann Intern Med*. 2016;165(2):125-33
- 4. Voinescu BI, Szentagotai A, David D. Internet-Administered Cognitive Behavioral Therapy For Insomnia. J Cogn Behav Psychot. 2013;13(1a):225-37
- Carlbring P, Andersson G, Cuijpers P, Riper H, Hedman-lagerlöf E. Internet-based vs. face-to-face cognitive behavior therapy for psychiatric and somatic disorders: an updated systematic review and meta-analysis. *Cogn Behav Ther*. 2018;47(1):1-18