SUPPLEMENTARY MATERIALS

- **Supplementary Table S12:** Days from randomization to immediate post-intervention assessment completion, and from randomization to 3-month post-intervention follow-up assessment completion, by treatment group

4. Supplementary Figures:

- **Supplementary Figure S1:** Structure and Content of 5-session ABC-I Intervention
- **Supplementary Figure S2:** Structure and content of 5-sessoin CBT-I Intervention
- **Supplementary Figure S3:** Sleep diary pages for ABC-I Note: recommendations are tracked daily by participants and used in the computation of the proportion adherant variables.
- **Supplementary Figure S4:** Sleep diary pages for CBT-I Note: recommendations are tracked daily by participants and used in the computation of the proportion adherant variables.
- **Supplementary Figure S5:** *Non-inferiority outcomes: Difference in Difference (DiD) with 90% Confidence Intervals for* Pittsburth Sleep Quality Index (PSQI) subscales (A. Factor 1: Sleep Efficiency; B. Factor 2: Sleep Quality; C. Factor 3: Daily disturbance).
- **Supplementary Figure S6: Mean** Duration of Intervention Sessions by Treatment Group

Supplementary Methods

Identification of Mental Health Disorders

The Mini-International Neuropsychiatric Interview (M.I.N.I.) was used to identify mental health disorders.(Sheehan et al., 1998) The M.I.N.I is a standardized semi-structured interview for diagnosing DSM-IV-TR2 lifetime and current Axis I mental disorders. The M.I.N.I. was administered by trained clinicians (JM, NC, SKM, MK) who established test-retest and inter-rater reliabilities >0.90. Participants were not excluded due to the presence of an Axis I disorder; however, participants were excluded for bipolar disorder, psychosis, active substance use disorder. These determinations were made based on the MINI assessment. **Supplementary Table S10** shows rates of diagnosed conditions in randomized and non-randomized participants. Supplementary Tables S11 shows MINI diagnoses for randomized participants by group.

Sleep Disorders Measures

We screened participants for two common sleep disorders, restless leg syndrome and sleep apnea, that could be contributing to their sleep disruption. Participants were screened for restless leg syndrome (RLS) using the 4-item Restless Leg Syndrome scale, developed by the Restless Legs Syndrome Workgroup.(Group, 2003) A score of 2 or more is considered positive for RLS. Only participants with severe untreated RLS were excluded from randomization.

To screen for sleep apnea, participants had one night of home sleep apnea testing (HSAT) using the WatchPAT 100 device (Itamar Medical, Ltd.). Following the Medicare National Coverage Determinations, an apnea hypopnea index (AHI) $\geq$15 events per hour was considered diagnostic for sleep apnea. We also screened for daytime sleepiness using the Epworth Sleepiness Scale (ESS).(Johns, 1991) An ESS score >10 is the published cut-point for excessive daytime sleepiness. Participants in this study with an AHI >30 were not eligible for randomization. Those with an AHI between 15 and 30 (moderate sleep apnea) and with daytime sleepiness (ESS score >10) were also not eligible for randomization. Participants with an AHI between 15 and 30, but who did not have daytime sleepiness (ESS score $\leq$10) were eligible for randomization. Participants excluded from randomization based on their AHI were informed of the results and were encouraged to seek further evaluation and treatment for sleep apnea.

Other Health Measures

The comorbidity checklist is a validated measure from the Australian Longitudinal Study on Women's Health (www.alswh.org.au). It includes 22 health conditions commonly experienced by women. For each condition, the question stem is "Has a doctor or nurse ever told you that you have…," with a Yes or No response. For the current study, we also incorporated 5 additional items from the SWAN survey inquiring about health conditions that were specifically more common among women (e.g., thyroid disease, breast and ovarian cancer). Total scores for the checklist range from 0-27 with higher scores indicating greater comorbidity.

Inclusion/Exclusion details

The CONSORT diagram shows the overall flow of participants, including the number excluded at each step. Here we provide specific details regarding exclusions:

Exclusion prior to during telephone screening prior to enrollment (n=22; not eligible for enrollment):

- n=6 No access to transportation
- n=6 Distance to VA is too far
- n=4 Unstable living situation
- n=3 Medically/psychiatrically unstable (based on patient report only)
- n=1 Pregnant
- n=1 Time conflict/cannot attend sessions
- n=1 No longer has sleep problems

Exclusions after enrollment, but prior to randomization due to severe psychiatric illness or presence of psychiatric contraindications (n=49):

- n=10 active substance use
- n=27 bipolar disorder with clear history of mania
- n=6 active suicidality (2 with recent attempt)
- n=5 with active psychosis
- n=1 uncontrolled panic disorder, severe depression not receiving treatment

Excluded after enrollment, but prior to randomization due to medical factors (n=7)

- n=2 seizure disorder, not well controlled
- n=2 recently diagnosed cancer, receiving cancer treatment (chemotherapy/radiation)
- n=1 lupus, experiencing significant symptom exacerbation
- n=1 upcoming heart surgery
- n=1 multiple complex comorbid conditions, including pulmonary disease causing significant respiratory symptoms

Calculations for treatment adherence variables

Before beginning the study, we decided to use the proportion of opportunities to follow recommends as our outcome. At each session, recommendations were given by the interventionist and tracked by the participant in their daily sleep diary (see supplementary figures S3 and S4. At the next session, the recommendations (and their documentation in the sleep diary) were reviewed and discussed.

We computed three main adherence variables for the study. For each variable, the proportion adherent ranged from 0 (not adherent to any recommendation on any night), to 1.00 (adherent to all recommendations on all nights). If the participant did not complete the sleep diary, that observation was considered "missing" and was not included in the numerator or denominator. The percentage with complete diaries by treatment group for week 1 was CBT-I 92.0%, ABC-I 87.8%; for week 2 was CBT-I 92.0%, ABC-I 87.8%; for week 3 was CBT-I 90.7%, ABC-I 86.5%; for week 4 was CBT-I 90.7%, ABC-I 83.8%. The diary completion rate was not significantly different between the groups for any of the weeks (Fisher's Exact p's < 0.229).

1. Adherence to bedtime: proportion of nights participant's documented bedtime was no more than 15 minutes prior to the agreed-upon time for that week).
2. Adherence to rise time: proportion of mornings participant's documented rise time was no more than 15 minutes later than the agreed-upon time for that week).

3. Adherence to other behavioral recommendations (i.e., sleep hygiene and stimulus control, other than sleep schedule): the proportion of opportunities (i.e., the number of nights times the number of recommendations) a participant documented following a specific recommendation.

Regarding the stimulus control recommendation to get out of bed when struggling with sleep, we used the diary question "Did you get out of bed last night because you were struggling with sleep?" We only considered this as an "adherence opportunity" if the participant indicated being awake at night for 20 minutes or more (since it would not apply for brief awakenings).

For other recommendations that were specific to an individual (i.e., only given if the individual engaged in these behaviors), the items were listed individually on the dairy, and participants were asked to check "yes" or "no" regarding whether they followed the recommendation on a given day. For example, if a participant received the following recommendations:

1. Do not watch TV in bed (sleep hygiene and stimulus control)
2. Eliminate caffeine after lunch (sleep hygiene)

Over a 1-week period, they would have 14 opportunities to follow the recommendations (7 days x 2 recommendations). If they followed the recommendation not to watch TV in bed every day, but had caffeine in the evening 3 times, their proportion adherent would be 11/14 times. The "proportion adherent" would be 0.79.

Interventions

In both ABC-I and CBT-I, sessions were manual-based and followed a structured format that included presentation of the session content using hand-outs to illustrate the basic concepts. Activities (e.g., checklists, metaphors, mindfulness exercises) were used to reinforce concepts and to help participants evaluate their own behaviors, beliefs, and values in relation to insomnia. The interventionist assisted participants in identifying specific behaviors contributing to poor sleep and creating an Action Plan to follow each week. The Action Plan included an agreed upon sleep schedule and up to three individualized recommendations to address behaviors related to stimulus control and sleep hygiene. The ABC-I intervention group also received mindfulness and other ACT-focused exercises and the CBT-I group received cognitive restructuring exercises to use on an "as needed" basis between sessions. These recommendations were written in the sleep diary that the participant maintained daily between treatment sessions. Participants were also asked to track their use of ACT and cognitive therapy exercises in the sleep diary although their use was not considered an "adherence" outcome since participants were instructed to use these when needed. The intervention sleep diary included the same sleep-related questions as the baseline assessment diary (e.g., time bedtime, number of nighttime awakenings, rise time) and asked the participant to indicate each day whether they had followed each behavioral recommendation. At the beginning of sessions 2-5, the interventionist used the sleep diary to calculate the total sleep time and sleep efficiency for the prior week and review the participant's adherence with the behavioral recommendations. This information was used to adjust the sleep schedule and behavioral recommendations.

Treatment sessions were conducted by one of four clinical psychologists (JM, NC, MK, SKM). The study therapists were all licensed clinical psychologists with a range of experience levels in delivery of CBT-I and basic knowledge of ACT. One therapist (JM) was involved in development of the ABC-I intervention. The other three therapists were instructed in the ABC-I

treatment by LF and JLM who were the original developers of the ABC-I treatment protocol. The training included didactic instruction, followed by review of recorded ABC-I sessions. Finally, each therapist completed a full course of ABC-I with a study participant, and recordings were reviewed and discussed by LF or JLM. After these steps, all therapists were able to complete the sessions with fidelity. To avoid differences across therapists (e.g., due to non-specific factors), all therapists delivered both treatments using the study materials and protocols for each arm. All sessions were audio-recorded for training purposes and for assessment of intervention fidelity at the end of the study. At the end of each session, the interventionists completed a session-specific checklist that included documentation of recommendations, notation of all topics/activities covered within the session, as well as the start and end time of the session.

Follow-up visit timeline

The first post-treatment visit was scheduled immediately after the intervention concluded and typically was completed within 10 days of the last treatment session (including the 7-day sleep diary and wrist actigraphy monitoring). The second post-treatment visit was scheduled to begin 3-months after the last treatment session, and on average, began 3.75 months after treatment ended. This did not differ between treatment groups. The details of when assessments were completed is shown in **Supplementary Table S12.**

While it is customary to link all study visits to randomization, we wished to explore the durability of treatment benefits beyond the last therapy session in a systematic way. As a result, we linked the long-term follow-up assessment to the final intervention session rather than randomization. Although some visits were delayed, we included all available data regardless of whether it was collected after the scheduled timeline.

Data Analyses

All statistical tests were traditional null hypotheses tests using alpha=0.05, except for the tests of non-inferiority (which are described below). The sample size was determined by power calculations with respect to the non-inferiority hypothesis testing that determined 80% power would be achieved with alpha=0.05 (one tail) to establish non-inferiority using a non-inferiority margin (NIM) of d=.40 with a target sample of N=148 randomized, and an estimated N=138 remaining in the study at the 3-month follow-up (i.e., the primary outcome timepoint). This sample size also had sufficient power to detect a difference in treatment completion of 16% or larger between groups. Final numbers by outcome are shown in Figure 1.

Baseline group differences (caveats)

We acknowledge that by virtue of randomization, baseline differences between treatment groups occur by chance, and we caution readers about interpretation of these statistical tests. As noted by CONSORT,(Moher et al., 2010) "…significance tests of baseline differences are still common [23, 32,210]; they were reported in half of 50 RCTs trials published in leading general journals in 1997 [183]. Such significance tests assess the probability that observed baseline differences could have occurred by chance; however, we already know that any differences are caused by chance. Tests of baseline differences are not necessarily wrong, just illogical [211]. Such hypothesis testing is superfluous and can mislead investigators and their readers".

Non-inferiority margins

Non-inferiority is established by framing the null hypotheses in terms of the *Difference in Difference* compared to a pre-specified value, delta (δ), which represents the Non-Inferiority Margin (NIM, also called the Equivalence Margin (Walker & Nowacki, 2010)).
Where information was available, the non-inferiority margin was selected based on information from prior literature, yielding an a-priori value of 2 for the ISI, 2 for PSQI, and 5% for objectively measured sleep percent (see column 1 of **Supplementary Table S3**). Where no a-priori information was available, a value of 4/10ths of the baseline standard deviation was used (see Column 2 of **Supplementary Table S3**). We also computed Column 2 for outcomes which did have an a-priori NIM. The final NIM used in the analysis was the lesser of columns 1 or 2.

Intervention Fidelity Methods

In both groups, sessions were audio-recorded, and treatment fidelity was assessed by review of a random sample of recordings from 10% of study participants psychologist by another study interventionist. This was done using a fidelity monitoring form on which raters evaluated the degree to which each of the intervention topics were covered: 3=Therapist skillfully and thoroughly explained all of the concepts related to this content; 2=Therapist skillfully and thoroughly explained the majority of the concepts related to this content, and 1=Therapist explained less than half of the concepts related to this content.

To assess potential contamination across arms, the three specific items were evaluated for each treatment. For the ABC-I arm the presence of (1) Challenging of thoughts, (2) Restructuring of thoughts, and (3) Discussion of sleep efficiency from sleep diary were considered "contamination". For the CBT-I arm the presence of (1) Mindfulness practices (de-fusion of thought), (2) ACT metaphors (i.e., Chinese finger trap, surfing), and (3) Discussing values or using patient values to motivate or engage were considered "contamination."

Data and Resource Sharing

Deidentified and summary data used in this study may be available through execution of a data use agreement (DUA) between the requester (and their institution) and the PI through the VA Greater Los Angeles Healthcare System. Materials used for the intervention may be available through written request to JLM through the VA Greater Los Angeles Healthcare System after the conclusion of the study and publication of the main study findings and outcomes.

Supplementary Results

Intervention Fidelity

Interventionists' treatment fidelity ratings were reviewed in a random sample of nine ABC-I participants (45 sessions) and eight CBT-I participants (40 sessions). Ninety-eight percent of ABC-I and CBT-I session topics were covered by the interventionists. From the interventionists' session checklists, the percent of topics (scored as "3") completed in each session ranged from 94.2% to 100% in the ABC-I group and 98.6% to 99.6% in the CBT-I group. Overall, the mean percent of completed topics was 98.9% for the ABC-I group and 99.2% for the CBT-I group ($p = 0.37$).

Raters founds only two minor instances of cross-contamination between the ABC-I and CBT-I treatments. In session one of ABC-I in one recording, the interventionist included challenging and restructuring a thought, and in session one of CBT-I, the interventionist mentioned an ACT metaphor (cleaning out your closet, which was not specifically included in the ABC-I materials, but raters agreed it had a similar effect in the session and represented an ACT-based strategy).

Session characteristics

We computed the average length for each session within each intervention, and the total amount of time in all sessions by treatment group. Supplemental Figure S6 shows the mean length of each session by group, and the mean duration of sessions overall. The difference in average session duration between groups was 4 minutes (i.e., ABC-I sessions were an average of 4 minutes longer than CBT-I sessions; p=.007).

Supplementary Table S1: Additional Demographic and Health Measures at Baseline

Variable	Overall *N* = 149 Mean (*SD*) or Number (%)	ABC-I *N* = 74 Mean (*SD*) or Number (%)	CBT-I *N* = 75 Mean (*SD*) or Number (%)	*p*-value[b]
Employment status[a]				
Employed	88 (59.1%)	48 (64.9%)	40 (53.3%)	0.183
Unable to work	13 (8.7%)	8 (10.8%)	5 (6.7%)	0.401
Unemployed	12 (8.1%)	6 (8.1%)	6 (8.0%)	1.000
Retired	23 (15.4%)	8 (10.8%)	15 (20.0%)	0.173
Student	17 (11.4%)	8 (10.8%)	9 (12.0%)	1.000
Homemaker	6 (4.0%)	3 (4.1%)	3 (4.0%)	1.000
Income				
$10,000 or less	7 (4.8%)	3 (4.1%)	4 (5.5%)	0.771
$10,001-$20,000	15 (10.3%)	7 (9.6%)	8 (11.0%)	
$20,001-$30,000	19 (13.0%)	9 (12.3%)	10 (13.7%)	
$30,001-$40,000	17 (11.6%)	8 (11.0%)	9 (12.3%)	
$40,001-$50,000	22 (15.1%)	11 (15.1%)	11 (15.1%)	
$50,001-$100,000	41 (28.1%)	25 (34.2%)	16 (21.9%)	
Over $100,000	25 (17.1%)	10 (13.7%)	15 (20.5%)	
Living with others/alone				
Alone	34 (22.8%)	16 (21.6%)	18 (24.0%)	0.321
Spouse or partner only	28 (18.8%)	12 (16.2%)	16 (21.3%)	
Spouse and others	28 (18.8%)	11 (14.9%)	17 (22.7%)	
Child or other family	45 (30.2%)	28 (37.8%)	17 (22.7%)	
Others, not family	13 (8.7%)	6 (8.1%)	7 (9.3%)	
Other	1 (0.7%)	1 (1.4%)	0 (0.0%)	
No. of children under 18 in household	0.5 (0.8)	0.5 (0.8)	0.5 (0.9)	0.589
Caregiver for individual over 18	21 (20.2%)	9 (17.0%)	12 (23.5%)	0.469
Years since sleep problem onset	17.4 (12.4)	20.4 (13.1)	14.4 (11.0)	0.020
Managed sleep problem with[a]:				
Nothing	28 (18.8%)	14 (18.9%)	14 (18.7%)	1.000
Prescription medication	71 (47.7%)	37 (50.0%)	34 (45.3%)	0.624
Psychotherapy	43 (28.9%)	24 (32.4%)	19 (25.3%)	0.370
OTC or herbal remedies	79 (53.0%)	39 (52.7%)	40 (53.3%)	1.000
Other	72 (48.3%)	30 (40.5%)	42 (56.0%)	0.072
Restless Leg Syndrome (RLS) Scale, high risk for RLS	29 (19.5%)	10 (13.5%)	19 (25.3%)	0.097
Apnea Hypopnea Index (mean)	6.4 (6.5)	6.5 (6.8)	6.3 (6.2)	0.804
% with AHI 5 to 15	50 (33.6%)	23 (31.1%)	27 (36.0)	0.604
% with AHI > 15 to 30	16 (10.7%)	9 (12.2%)	7(9.3%)	0.608
Comorbidity Index, total endorsed	5.2 (3.1)	5.1 (3.2)	5.3 (3.0)	0.818
Morningness/Eveningness (MEQ)	38.5 (8.4)	39.0 (8.9)	38.0 (8.0)	0.492

[a]Participants could check all that applied; [b]*p*-value is from two sample t-test or Fisher's exact test.

Supplementary Table S2: Frequency of Health Conditions Endorsed on Comorbidity Measure (alphabetical order)

	Total *N* = 149 *n* (%)	ABC-I *N* = 74 *n* (%)	CBT-I *N* = 75 *n* (%)	*p*-value[a]
Arthritis	76 (51%)	34 (46%)	42 (56%)	0.253
Diabetes	15 (10%)	8 (11%)	7 (9%)	0.792
Impaired glucose tolerance	8 (5%)	2 (3%)	6 (8%)	0.276
Heart disease	8 (5%)	3 (4%)	5 (7%)	0.719
Hypertension	36 (24%)	15 (20%)	21 (28%)	0.339
Stroke	6 (4%)	4 (5%)	2 (3%)	0.442
Thrombosis	5 (3%)	4 (5%)	1 (1%)	0.209
Anemia	72 (48%)	38 (51%)	34 (45%)	0.514
Asthma	37 (25%)	19 (26%)	18 (24%)	0.851
Bronchitis/emphysema	36 (24%)	16 (22%)	20 (27%)	0.567
Chronic obstructive pulmonary disease	7 (5%)	3 (4%)	4 (5%)	1.000
Osteoporosis	8 (5%)	5 (7%)	3 (4%)	0.494
Breast cancer	7 (5%)	2 (3%)	5 (7%)	0.442
Cervical cancer	5 (3%)	3 (4%)	2 (3%)	0.681
Skin cancer	6 (4%)	4 (5%)	2 (3%)	0.442
Chronic fatigue syndrome	15 (10%)	7 (9%)	8 (11%)	1.000
Sexually transmitted infections	38 (26%)	19 (26%)	19 (25%)	1.000
High cholesterol	43 (29%)	21 (28%)	22 (29%)	1.000
Frequent urination/incontinence	32 (21%)	15 (20%)	17 (23%)	0.842
Gastroesophageal reflux disease	47 (32%)	26 (35%)	21 (28%)	0.382
Thyroid disease	25 (17%)	13 (18%)	12 (16%)	0.830
Traumatic brain injury	12 (8%)	8 (11%)	4 (5%)	0.245
Chronic back pain	77 (52%)	36 (49%)	41 (55%)	0.514
Chronic headaches	65 (44%)	32 (43%)	33 (44%)	1.000

[a]p-value is from Fisher's exact test.

Supplemental Table S3: Non-Inferiority Margin (NIM) specified for computation of statistical power and determined in study for use in final analyses.

Outcome	(1) A-priori Non-Inferiority Margin (NIM)	(2) Calculated Non-inferiority Margin (NIM=0.4 * *SD*)	(3) Final NIM
Insomnia Severity Index (ISI)	2.0	1.98	1.98
Pittsburgh Sleep Quality Index (PSQI), total score	2.0	1.48	1.48
PSQI Factor 1: Sleep efficiency	---	0.78	0.78
PSQI Factor 2: Perceived sleep quality	---	0.81	0.81
PSQI Factor 3: Daily disturbances	---	0.47	0.47
Sleep efficiency (SE) by sleep diary, in percent[1]	---	-5.27	-5.27
Sleep efficiency (SE), by actigraphy, in percent[1]	-5.0	-3.27	-3.27

Column (1) shows the a-priori NIM chosen in the proposal.
Column (2) shows the NIM using 0.4**SD*.
Column (3) shows the final NIM, which is the lesser of columns 1 and 2.
[1]NIM values are negative, because higher scores are better.

Supplementary Table S4: *Estimated Means (From Mixed Model) of PSQI Subscales at Each Time Point (ABC-I = 74, CBT-I = 75)*

Outcome	Group	Baseline	Post-Treatment	3-Month Follow-up
		Mean (90% CI)	Mean (90% CI)	Mean (90% CI)
PSQI Factor 1: Sleep efficiency	ABC-I	3.6 (3.4, 4.0)	1.4 (1.1, 1.6)	1.7 (1.3, 2.1)
	CBT-I	3.7 (3.4, 4.1)	1.4 (1.1, 1.6)	1.8 (1.5, 2.3)
PSQI Factor 2: Perceived sleep quality	ABC-I	4.1 (3.7, 4.5)	2.0 (1.5, 2.4)	1.9 (1.5, 2.3)
	CBT-I	4.5 (4.1, 4.9)	1.8 (1.5, 2.1)	2.6 (2.2, 3.0)
PSQI Factor 3: Daily disturbances	ABC-I	2.6 (2.4, 2.8)	1.9 (1.7, 2.1)	1.8 (1.6, 2.0)
	CBT-I	2.8 (2.6, 3.0)	1.9 (1.7, 2.1)	1.9 (1.7, 2.2)

Supplementary Table S5. *Non-inferiority Analyses of PSQI subscales (ABC-I =74, CBT-I = 75)*

Outcome	Non-Inferiority Margin[c] (NIM)	Change Baseline to Post-Treatment Difference in Difference (DiD): Mean (90% CI)	One sided-test of non-inferiority (z, p-value)	Change Basel Difference in Difference (DiD): Mean (90% CI)
PSQI Factor 1: Sleep efficiency [a]	0.78	0.09 (-0.44, 0.63)	z = -2.12, p = 0.017	-0.06 (-0.68, 0.56
PSQI Factor 2: Perceived sleep quality [a]	0.81	0.61 (0.06, 1.16)	z = -0.59, p = 0.276	-0.28 (-0.91, 0.35
PSQI Factor 3: Daily disturbances [a]	0.47	0.15 (-0.21, 0.51)	z = -1.45, p = 0.074	0.03 (-0.29, 0.35

Notes: [a]Higher values reflect worse sleep; non-inferiority test is left-sided; [b]Higher values reflect better sleep; non-inferiority test is right-sided. See **Supplementary Methods and Table S3** for information on selection of non-inferiority margins. CBT-I: Cognitive-behavioral therapy for insomnia; ABC-I Acceptance and the behavioral changes to treat insomnia.

Supplementary Table S6. Tests of simple contrasts on time for each intervention

	Post vs. Baseline		**3-Month vs. Baseline**	
	Contrast [95% CI]	p-value	Contrast [95% CI]	p-value
Insomnia Severity Index (ISI), total score				
ABC-I	-8.68 [-9.95,-7.41]	<0.001	-8.29 [-9.77,-6.80]	<0.001
CBT-I	-9.18 [-10.41,-7.95]	<0.001	-7.71 [-9.17,-6.26]	<0.001
Pittsburgh Sleep Quality Index (PSQI), total score				
ABC-I	-5.11 [-6.01,-4.21]	<0.001	-4.98 [-6.00,-3.95]	<0.001
CBT-I	-6.00 [-6.87,-5.13]	<0.001	-4.70 [-5.70,-3.71]	<0.001
PSQI Factor 1: Sleep Efficiency				
ABC-I	-2.29 [-2.75,-1.84]	<0.001	-1.98 [-2.51,-1.45]	<0.001
CBT-I	-2.39 [-2.83,-1.94]	<0.001	-1.92 [-2.44,-1.41]	<0.001
PSQI Factor 2: Perceived Sleep Quality				
ABC-I	-2.10 [-2.57,-1.62]	<0.001	-2.19 [-2.72,-1.65]	<0.001
CBT-I	-2.71 [-3.16,-2.25]	<0.001	-1.91 [-2.43,-1.38]	<0.001
PSQI Factor 3: Daily Disturbances				
ABC-I	-0.75 [-1.06,-0.44]	<0.001	-0.84 [-1.11,-0.57]	<0.001
CBT-I	-0.90 [-1.20,-0.61]	<0.001	-0.87 [-1.14,-0.60]	<0.001
Sleep efficiency (SE), by sleep diary, in percent				
ABC-I	13.88 [11.05,16.72]	<0.001	12.74 [9.77,15.72]	<0.001
CBT-I	13.47 [10.70,16.24]	<0.001	11.98 [9.10,14.87]	<0.001
Sleep efficiency (SE), by actigraphy, in percent				
ABC-I	2.32 [0.69,3.94]	0.005	1.33 [-0.61,3.27]	0.179
CBT-I	1.64 [0.07,3.20]	0.040	0.22 [-1.63,2.07]	0.818

Supplementary Table S7. Tests of simple contrasts on time for each treatment for additional outcomes measured by actigraphy.

	Post vs. Baseline		**3-Month vs. Baseline**	
	Contrast [95% CI]	*p*	Contrast [95% CI]	*p*
Total sleep time, by actigraphy, in minutes				
ABC-I	-9.75 [-21.48,1.97]	0.103	-2.97 [-17.66,11.72]	0.692
CBT-I	-20.28 [-31.53,-9.02]	<0.001	-12.44 [-26.36,1.47]	0.080
Number of awakenings, by actigraphy, in percent				
ABC-I	-1.95 [-3.49,-0.42]	0.013	-0.37 [-2.02,1.28]	0.658
CBT-I	-2.35 [-3.82,-0.88]	0.002	-1.31 [-2.87,0.25]	0.100
Napping (daytime sleep time), in minutes				
ABC-I	5.65 [-7.85,19.16]	0.412	7.68 [-8.19,23.54]	0.343
CBT-I	3.71 [-9.21,16.64]	0.574	-4.98 [-19.82,9.87]	0.511

Supplementary Table S8. Changes across time (immediate post-treatment versus baseline; 3-month post-treatment follow-up versus baseline) by group assignment showing difference in means (with 95% CI) and Wald-test of hypothesis that the difference across time equals zero (no change).

		Post-Treatment versus Baseline		**3-Month versus Baseline**	
Outcome	Group	Mean Difference (95% CI)	Wald test	Mean Difference (95% CI)	Wald test
DBAS	CBT-I	-30.53 (-35.19, -25.87)	z = -12.85, p < 0.001	-27.66 (-32.37, -22.95)	z = -11.50, p < 0.001
	ABC-I	-23.00 (-27.81, -18.18)	z = -9.36, p < 0.001	-26.22 (-31.05, -21.39)	z = -10.64, p < 0.001
SHI	CBT-I	-11.42 (-13.15, -9.70)	z = -12.96, p < 0.001	-8.48 (-10.12, -6.85)	z = -10.20, p < 0.001
	ABC-I	-11.37 (-13.14, -9.59)	z = -12.52, p < 0.001	-9.68 (-11.34, -8.02)	z = -11.43, p < 0.001
AAQ	CBT-I	-6.03 (-7.75, -4.31)	z = -6.87, p < 0.001	-4.49 (-6.23, -2.75)	z = -5.05, p < 0.001
	ABC-I	-7.38 (-0.17, -5.59)	z = -8.08, p < 0.001	-8.11 (-9.90, -6.32)	z = -8.87, p < 0.001

AAQ = Acceptance and Action Questionnaire. ABC-I = acceptance and the behavioral changes to treat insomnia. CBT-I = cognitive behavioral therapy for insomnia. DBAS = dysfunctional beliefs and attitudes about sleep. SHI=sleep hygiene index scale.

Supplementary Table S9: Contrasts of group (ABC-I; CBT-I) by time (immediate post-treatment versus baseline; 3-month post-treatment follow-up versus baseline) showing contrast estimate and Wald test.

	Post-Treatment versus Baseline		**3-Month versus Baseline**	
Outcome	Contrast by ABC-I versus CBT-I (95% CI)	Wald test	Contrast by ABC-I versus CBT-I (95% CI)	Wald test
DBAS	7.53 (-0.83, 14.23)	$z = 2.20$, $p = 0.0283$	1.44 (-5.31, 8.19)	$z = 0.42$, $p = 0.675$
SHI	0.06 (-2.42, 2.54)	$z = 0.05$, $p = 0.963$	-1.20 (-3.52, 1.13)	$z = -1.01$, $p = 0.313$
AAQ	-1.34 (-3.83, 1.14)	$z = -1.06$, $p = 0.288$	-3.62 (-6.12, -1.13)	$z = -2.84$, $p = 0.004$

AAQ = Acceptance and Action Questionnaire. ABC-I = Acceptance and the Behavioral Changes to treat Insomnia. CBT-I = Cognitive Behavioral Therapy for Insomnia. DBAS = Dysfunctional Beliefs and Attitudes about Sleep. SHI = Sleep Hygiene Index scale.

Supplementary Table S10. Number of participants meeting diagnostic criteria for mental health conditions assessed with the MINI assessment at baseline with a comparison between randomized and not-randomized participants.

	Total (N=315)	Randomized (N=149)	Not Randomized (N=166)	p-value
Major depressive episode current	90 (28.8%)	40 (27.0%)	50 (30.5%)	0.533
Major depressive episode past	222 (70.5%)	97 (65.1%)	125 (75.3%)	0.049
Major depressive episode recurrent	154 (49.5%)	77 (52.4%)	77 (47.0%)	0.365
Suicidality current	128 (41.0%)	55 (36.9%)	73 (44.8%)	0.168
Manic Episode current	3 (1.0%)	0 (0.0%)	3 (1.8%)	0.249
Manic Episode past	20 (6.4%)	0 (0.0%)	20 (12.3%)	<0.001
Hypomanic episode past	4 (1.3%)	0 (0.0%)	4 (2.5%)	0.124
Bipolar1 current	4 (1.3%)	0 (0.0%)	4 (2.5%)	0.124
Bipolar1 past	13 (4.2%)	0 (0.0%)	13 (8.1%)	<0.001
Bipolar2 current	1 (0.3%)	0 (0.0%)	1 (0.6%)	1.000
Bipolar2 past	6 (1.9%)	0 (0.0%)	6 (3.8%)	0.030
Panic Disorder current	24 (7.7%)	12 (8.2%)	12 (7.4%)	0.834
Panic disorder past	68 (21.9%)	28 (19.0%)	40 (24.5%)	0.273
Agoraphobia	50 (16.0%)	16 (10.7%)	34 (20.9%)	0.020
Social phobia current	35 (11.2%)	11 (7.4%)	24 (14.7%)	0.048
Social phobia past	31 (10.0%)	8 (5.4%)	23 (14.1%)	0.013
Social phobia non-generalized	8 (2.6%)	5 (3.4%)	3 (1.8%)	0.484
Obsessive-Compulsive disorder current	16 (5.2%)	3 (2.0%)	13 (8.1%)	0.020
Posttraumatic stress disorder current	118 (37.9%)	51 (34.2%)	67 (41.4%)	0.201
Alcohol dependence	11 (3.5%)	2 (1.3%)	9 (5.6%)	0.063
Alcohol abuse	4 (1.3%)	1 (0.7%)	3 (1.9%)	0.624
Substance dependence	6 (1.9%)	1 (0.7%)	5 (3.1%)	0.217
Psychotic disorder lifetime	11 (3.6%)	2 (1.3%)	9 (5.6%)	0.063
Psychotic disorder current	4 (1.3%)	0 (0.0%)	4 (2.5%)	0.124
Mood disorder lifetime	8 (2.6%)	2 (1.3%)	6 (3.8%)	0.285
Mood disorder current	6 (1.9%)	1 (0.7%)	5 (3.1%)	0.216
Bulimia nervosa	4 (1.3%)	4 (2.7%)	0 (0.0%)	0.052
Generalized anxiety	61 (19.6%)	27 (18.1%)	34 (21.0%)	0.569
Antisocial personality	3 (1.0%)	2 (1.4%)	1 (0.6%)	0.607

Note: For each category, table shows n (%) coded as yes. Categories always coded no were omitted. They were: Hypomanic episode current, Bipolar NOS current, Bipolar NOS past, Substance abuse, Anorexia nervosa, Bulimia nervosa, binge eating/purging. [a]p-value is from Fisher's exact test.

Supplementary Table S11: Number of participants meeting diagnostic criteria for mental health conditions assessed with the MINI assessment at Baseline by treatment group.

	ABC-I (N=75)	CBT-I (N=74)	Total (N=149)	p-value
Major depressive episode current	23 (31.1%)	17 (23.0%)	40 (27.0%)	0.355
Major depressive episode past	47 (62.7%)	50 (67.6%)	97 (65.1%)	0.607
Major depressive episode recurrent	37 (50.7%)	40 (54.1%)	77 (52.4%)	0.742
Suicidality current	27 (36.0%)	28 (37.8%)	55 (36.9%)	0.866
Panic Disorder current	8 (10.8%)	4 (5.5%)	12 (8.2%)	0.367
Panic disorder past	18 (24.3%)	10 (13.7%)	28 (19.0%)	0.141
Agoraphobia	11 (14.7%)	5 (6.8%)	16 (10.7%)	0.185
Social phobia current	7 (9.3%)	4 (5.4%)	11 (7.4%)	0.533
Social phobia past	6 (8.1%)	2 (2.7%)	8 (5.4%)	0.275
Social phobia non-generalized	3 (4.1%)	2 (2.7%)	5 (3.4%)	1.000
Obsessive-Compulsive disorder current	0 (0.0%)	3 (4.1%)	3 (2.0%)	0.120
Posttraumatic stress disorder current	26 (34.7%)	25 (33.8%)	51 (34.2%)	1.000
Alcohol dependence	2 (2.7%)	0 (0.0%)	2 (1.3%)	0.497
Alcohol abuse	1 (1.4%)	0 (0.0%)	1 (0.7%)	1.000
Substance dependence	1 (1.3%)	0 (0.0%)	1 (0.7%)	1.000
Psychotic disorder lifetime	1 (1.3%)	1 (1.4%)	2 (1.3%)	1.000
Mood disorder lifetime	0 (0.0%)	2 (2.7%)	2 (1.3%)	0.245
Mood disorder current	0 (0.0%)	1 (1.4%)	1 (0.7%)	0.497
Bulimia nervosa	3 (4.0%)	1 (1.4%)	4 (2.7%)	0.620
Generalized anxiety	16 (21.3%)	11 (14.9%)	27 (18.1%)	0.396
Antisocial personality	1 (1.3%)	1 (1.4%)	2 (1.4%)	1.000

For each category, table shows n (%) coded as ``yes''.
The following categories were always coded ``no'' for randomized participants were omitted and listed here: Manic Episode current, Manic Episode past, Hypomanic episode current, Hypomanic episode past, Bipolar1 current, Bipolar 1 past, Bipolar 2 current, Bipolar 2 past, Bipolar NOS current, Bipolar NOS past, Substance abuse, Psychotic disorder current, Anorexia nervosa, Bulimia nervosa, binge eating/purging as these represented exclusionary criteria for randomization.
[a]p-value is from Fisher's exact test.

Supplementary Table S12: Days from randomization to immediate post-intervention assessment completion, and from randomization to 3-month post-intervention follow-up assessment completion, by treatment group

	Days from Randomization to Immediate Post-Intervention Follow-up		Days from Randomization to 3-Month Post-Intervention Follow-up	
	CBT-I	ABC-I	CBT-I	ABC-I
Minimum	34	33	119	119
5th percentile	35	34	127	126
10th percentile	36	35	130	131
25th percentile	40	37	138	134
50th percentile	44	43	145	147.5
75th percentile	52	51	163	182.5
90th percentile	71	88	196	238
95th percentile	94	107	221	280
Maximum	217	145	612	507

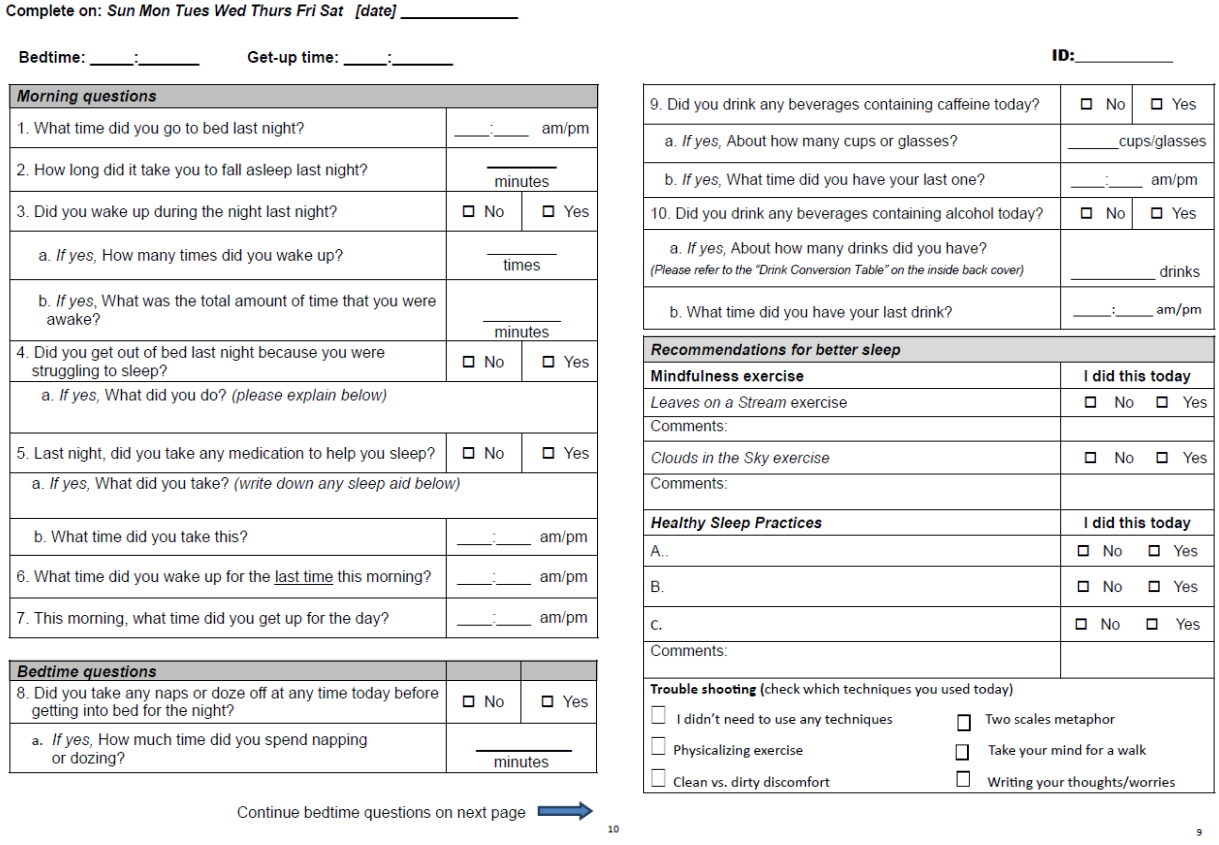
Figure S1: Structure and content of 5-session ABC-I Intervention

Overview of Topics Covered	In-session activities	Homework for next session
ABC-I Session 1: Learning How to Surf: An introduction to the ABC of Insomnia program (sleep education, sleep hygiene and stimulus control + ACT)		
Enhance motivation to adhere to behavioral prescriptions (values). Discuss futility of trying to control sleep. Sleep education: insomnia (3P model), sleep stages. Lifestyle habits that help/hinder sleep. Importance of sleep diary	Insomnia and what is important to you. Metaphors: Chinese finger trap; surfing. Leaves on a stream exercise. Develop action plan: sleep hygiene changes; stimulus control	Complete "Your Life With & Without Insomnia" sheets. Practice mindfulness exercise "Leaves on a Stream." Implement action plan (sleep hygiene; stimulus control). Complete daily sleep diary
ABC-I Session 2: Renovating your Home (sleep restriction therapy + ACT)		
Sleep diary review. Learn about the homeostatic and circadian sleep processes (sleep regulation). Discuss rationale behind sleep restriction. Discuss short-term discomfort for long-term benefits.	Establish time in bed window using sleep dairy. Introduction of key metaphors: pizza dough, silly putty; piggy bank; hiking; home renovation. Clouds in the Sky exercise. Develop action plan: daily sleep schedule	Implement action plan (sleep schedule, sleep hygiene practices) Complete daily sleep diary
ABC-I Session 3: Taking Your Mind for a Walk (ACT exercises)		
Sleep dairy review. Understand and explore the concept of dirty vs. clean discomfort. Experience cognitive de-fusion.	Adjust time in bed window using sleep dairy. Troubleshooting techniques: physicalizing and visualization. Take your mind for a walk exercise. Two scales metaphor. Develop action plan: revise sleep schedule	Implement action plan (sleep schedule; avoid napping) Follow healthy sleep habits. Practice "Leaves on a Stream" and/or "Clouds in the Sky" mindfulness exercises. Use trouble shooting techniques if having a hard time (e.g., Writing your thoughts/worries exercise. Complete daily sleep diary
ABC-I Session 4: Acceptance & Commitment (ACT exercises)		
Sleep diary review. Review progress and challenges.	Adjust time in bed window using sleep dairy. Address barriers and obstacles to recommendations. Develop action plan: new ways to face obstacles	Implement action plan (sleep schedule; strategies to address obstacles). Complete daily sleep diary
ABC-I Session 5: If Not Tonight, Tomorrow Night (relapse prevention + ACT)		
Sleep diary review. Understand relapse prevention techniques	Adjust time in bed window using sleep diary. Develop relapse prevention action plan	N/A

Figure S2: Structure and content of 5-sessoin CBT-I Intervention

Overview of Topics Covered	*In-session activities*	*Homework for next session*
CBT-I Session 1: Getting Solid Sleep (sleep education, sleep restriction, sleep hygiene)		
Sleep education: sleep regulation, insomnia (3P model). Introduce sleep schedule (building sleep drive and regularizing schedule). Lifestyle habits that enhance or hinder sleep. Importance of sleep diary	Discuss classical conditioning and insomnia. Baseline sleep diary review to establish time in bed window. Develop action plan: sleep hygiene changes; stimulus control.	Implement action plan (sleep schedule; sleep hygiene practices). Complete daily sleep diary.
CBT-I Session 2: The Sleep Bank and The Bed=Sleep (stimulus control)		
Sleep diary review. Learn about the stages of sleep. Expand on rationale behind sleep restriction. Introduce stimulus control	Adjust time in bed window using sleep dairy. Develop Action plan: daily sleep schedule; stimulus control targets.	Implement action plan (sleep schedule; no napping; stimulus control). Complete daily sleep diary.
CBT-I Session 3: Healthy Habits for Healthy Sleep (sleep hygiene)		
Sleep diary review. Discuss bedtime routine. Discuss habits that contribute to health and poor sleep	Adjust time in bed window using sleep dairy. Identify habits for healthy sleep. Develop Action plan: revise sleep schedule, sleep hygiene targets	Implement action plan (sleep schedule; bedtime routine; healthy sleep habits). Complete daily sleep diary.
CBT-I Session 4: Sleep and Your Mind –Thinking About Sleeping (cognitive therapy)		
Sleep diary review. Relationship between our thoughts and sleep. Cognitive strategies to address barriers to adherence	Adjust time in bed window using sleep dairy. Review thinking time, thought notebook, Common thinking errors, and 3-Cs. Develop action plan: identify obstacles and strategies to address them.	Implement action plan (sleep schedule; using cognitive-therapy methods). Complete daily sleep diary.
CBT-I Session 5: Sleep Well, Live Well: Healthy Sleep for Life (relapse prevention)		
Sleep diary review. Discuss relapse prevention and coping with future insomnia.	Adjust time in bed window using sleep dairy. Develop relapse prevention action plan	N/A

Figure S3: Sleep diary pages for ABC-I Note: recommendations are tracked daily by participants and used in the computation of the proportion adherant variables.



Complete on: *Sun Mon Tues Wed Thurs Fri Sat [date]* _____

Bedtime: ____:____ **Get-up time:** ____:____ **ID:**_____

Morning questions		
1. What time did you go to bed last night?	____:____ am/pm	
2. How long did it take you to fall asleep last night?	_____ minutes	
3. Did you wake up during the night last night?	☐ No	☐ Yes
a. *If yes,* How many times did you wake up?	_____ times	
b. *If yes,* What was the total amount of time that you were awake?	_____ minutes	
4. Did you get out of bed last night because you were struggling to sleep?	☐ No	☐ Yes
a. *If yes,* What did you do? *(please explain below)*		
5. Last night, did you take any medication to help you sleep?	☐ No	☐ Yes
a. *If yes,* What did you take? *(write down any sleep aid below)*		
b. What time did you take this?	____:____ am/pm	
6. What time did you wake up for the last time this morning?	____:____ am/pm	
7. This morning, what time did you get up for the day?	____:____ am/pm	

Bedtime questions		
8. Did you take any naps or doze off at any time today before getting into bed for the night?	☐ No	☐ Yes
a. *If yes,* How much time did you spend napping or dozing?	_____ minutes	

Continue bedtime questions on next page

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9. Did you drink any beverages containing caffeine today?	☐ No	☐ Yes
a. *If yes,* About how many cups or glasses?	_____cups/glasses	
b. *If yes,* What time did you have your last one?	____:____ am/pm	
10. Did you drink any beverages containing alcohol today?	☐ No	☐ Yes
a. *If yes,* About how many drinks did you have? *(Please refer to the "Drink Conversion Table" on the inside back cover)*	_____ drinks	
b. What time did you have your last drink?	____:____ am/pm	

Recommendations for better sleep	
Mindfulness exercise	**I did this today**
Leaves on a Stream exercise	☐ No ☐ Yes
Comments:	
Clouds in the Sky exercise	☐ No ☐ Yes
Comments:	
Healthy Sleep Practices	**I did this today**
A..	☐ No ☐ Yes
B.	☐ No ☐ Yes
C.	☐ No ☐ Yes
Comments:	

Trouble shooting (check which techniques you used today)

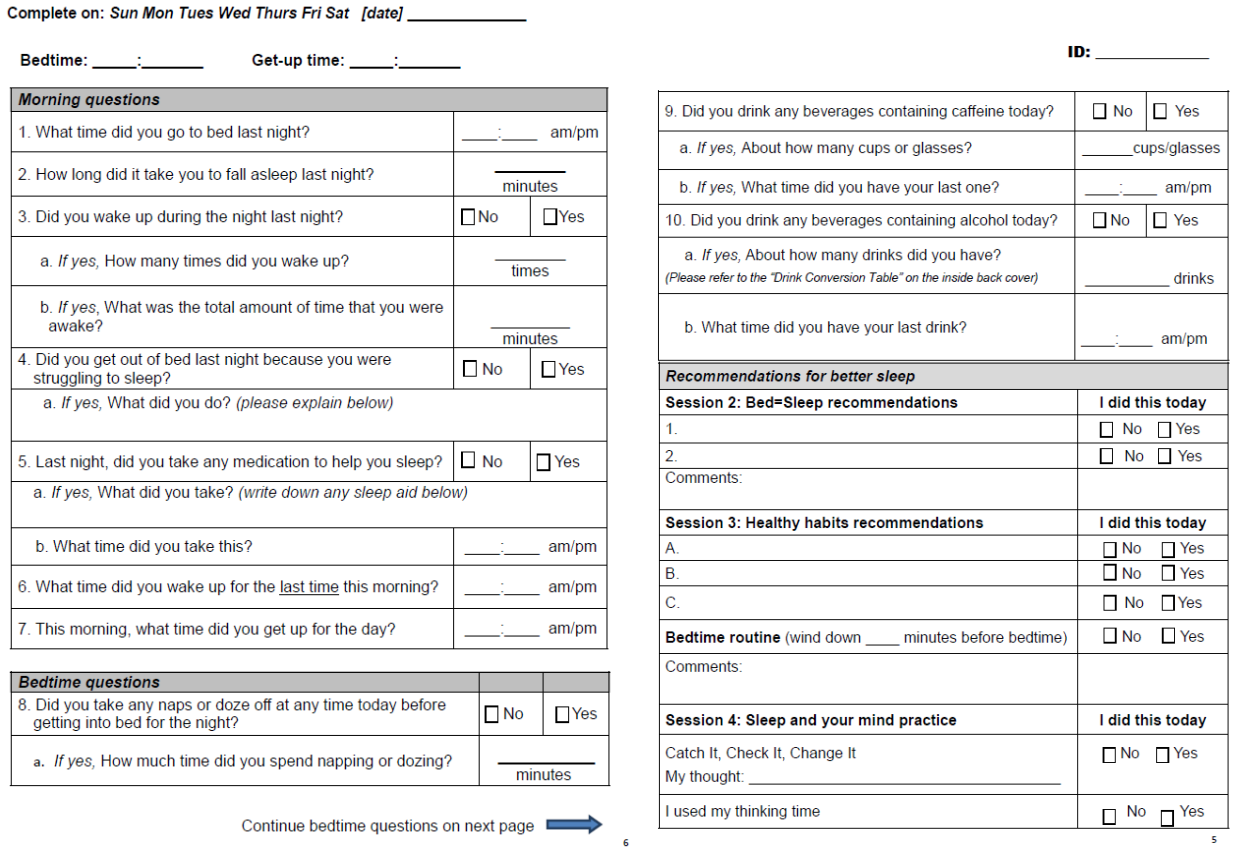
☐ I didn't need to use any techniques ☐ Two scales metaphor

☐ Physicalizing exercise ☐ Take your mind for a walk

☐ Clean vs. dirty discomfort ☐ Writing your thoughts/worries

9

Figure S4: Sleep diary pages for CBT-I Note: recommendations are tracked daily by participants and used in the computation of the proportion adherant variables.



Complete on: ***Sun Mon Tues Wed Thurs Fri Sat [date]*** _____

Bedtime: _____:_____ **Get-up time:** _____:_____

ID: _____

Morning questions		
1. What time did you go to bed last night?	____:____ am/pm	
2. How long did it take you to fall asleep last night?	_____ minutes	
3. Did you wake up during the night last night?	☐ No	☐ Yes
a. *If yes,* How many times did you wake up?	_____ times	
b. *If yes,* What was the total amount of time that you were awake?	_____ minutes	
4. Did you get out of bed last night because you were struggling to sleep?	☐ No	☐ Yes
a. *If yes,* What did you do? *(please explain below)*		
5. Last night, did you take any medication to help you sleep?	☐ No	☐ Yes
a. *If yes,* What did you take? *(write down any sleep aid below)*		
b. What time did you take this?	____:____ am/pm	
6. What time did you wake up for the last time this morning?	____:____ am/pm	
7. This morning, what time did you get up for the day?	____:____ am/pm	

Bedtime questions		
8. Did you take any naps or doze off at any time today before getting into bed for the night?	☐ No	☐ Yes
a. *If yes,* How much time did you spend napping or dozing?	_____ minutes	

Continue bedtime questions on next page

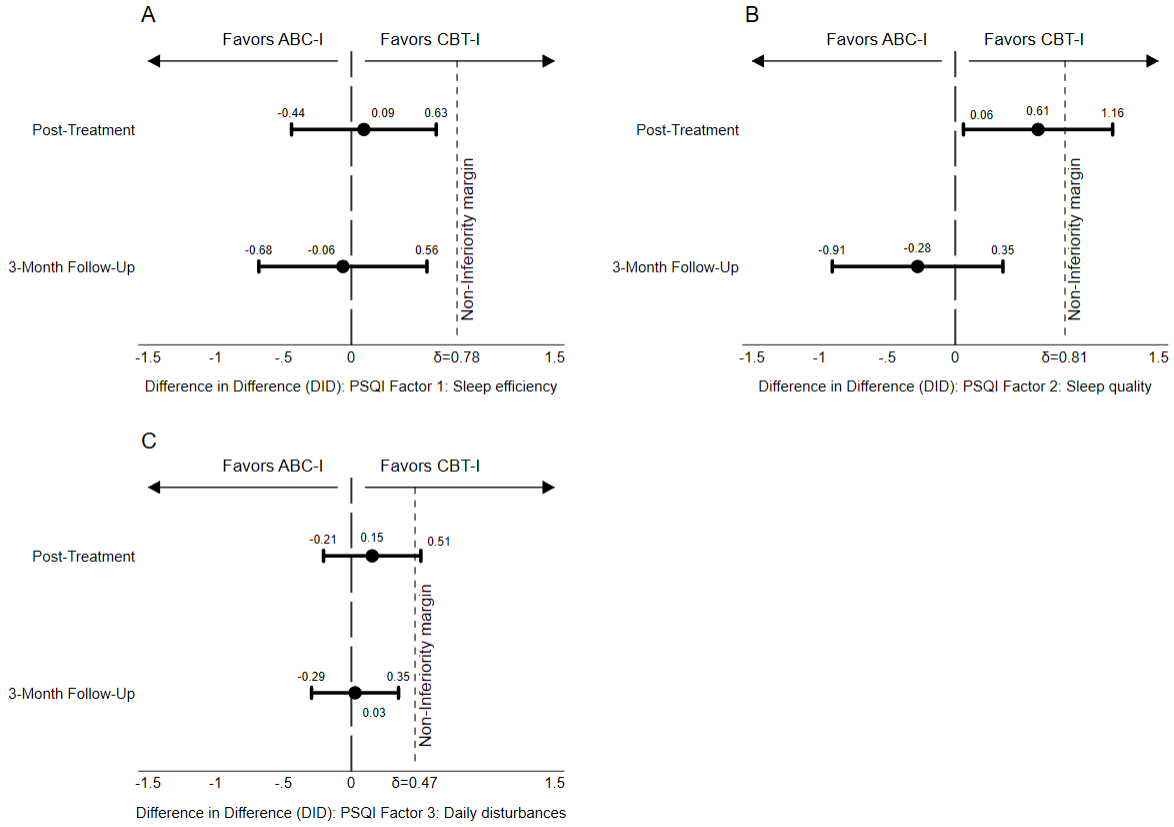
6

9. Did you drink any beverages containing caffeine today?	☐ No	☐ Yes
a. *If yes,* About how many cups or glasses?	_____cups/glasses	
b. *If yes,* What time did you have your last one?	____:____ am/pm	
10. Did you drink any beverages containing alcohol today?	☐ No	☐ Yes
a. *If yes,* About how many drinks did you have? *(Please refer to the "Drink Conversion Table" on the inside back cover)*	_____ drinks	
b. What time did you have your last drink?	____:____ am/pm	

Recommendations for better sleep	
Session 2: Bed=Sleep recommendations	**I did this today**
1.	☐ No ☐ Yes
2.	☐ No ☐ Yes
Comments:	
Session 3: Healthy habits recommendations	**I did this today**
A.	☐ No ☐ Yes
B.	☐ No ☐ Yes
C.	☐ No ☐ Yes
Bedtime routine (wind down ____ minutes before bedtime)	☐ No ☐ Yes
Comments:	
Session 4: Sleep and your mind practice	**I did this today**
Catch It, Check It, Change It My thought: _____	☐ No ☐ Yes
I used my thinking time	☐ No ☐ Yes

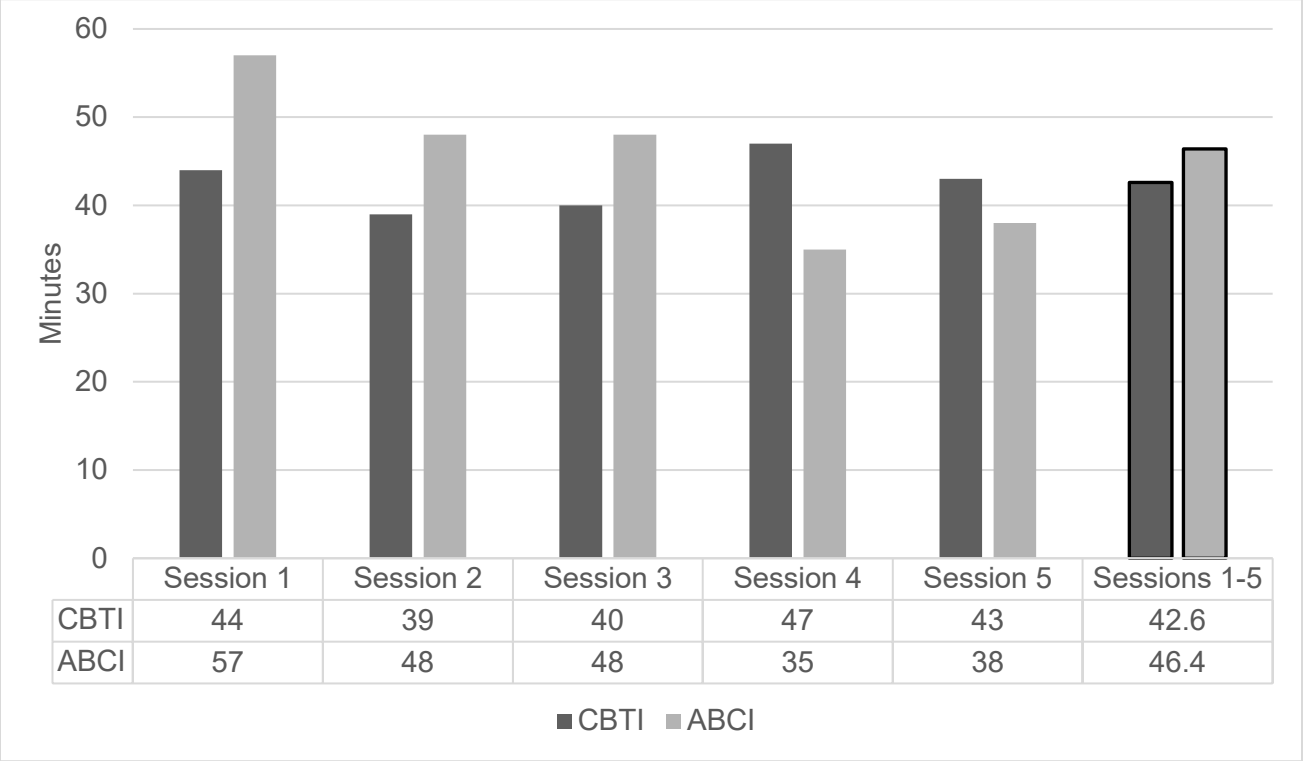
5

Supplementary Figure S5: Non-inferiority outcomes: Difference in Difference (DiD) with 90% confidence intervals (CI) for the Pittsburth Sleep Quality Index (PSQI) subscales (A. Factor 1: Sleep Efficiency; B. Factor 2: Sleep Quality; C. Factor 3: Daily disturbnce).



Notes: Non-inferiority margin (δ) depicted as dotted line on the x-axis.

Supplementary Figure S6: Mean Duration of Intervention Sessions by Treatment Group



	Session 1	Session 2	Session 3	Session 4	Session 5	Sessions 1-5
CBTI	44	39	40	47	43	42.6
ABCI	57	48	48	35	38	46.4

Supplementary Citations

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