

Cognitive Refocusing Treatment for Insomnia: A Randomized Controlled Trial in University Students

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This investigation assessed the efficacy of a technique specifically designed to change the style and content of presleep thoughts in order to reduce nighttime cognitive arousal and decrease insomnia severity. This investigation, termed “cognitive refocusing treatment for insomnia” (CRT-I), previously improved sleep in a small sample of veterans with primary insomnia. In this investigation, university students with poor sleep were randomly assigned to attend either one session of CRT-I and sleep hygiene education (SH; $n=27$) or one session of only SH ($n=24$). Insomnia severity (assessed by the Insomnia Severity Index) and nighttime arousal (assessed by the Pre-Sleep Arousal Scale) were measured at baseline and 1 month posttreatment. A significant Group \times Time interaction for insomnia severity suggested more improved sleep over time for those receiving CRT-I+SH. A trend for a Group \times Time interaction showed decreased cognitive arousal over time among those receiving CRT-I. These findings provide preliminary support for the efficacy of CRT-I for insomnia treatment among college students. Continued study of CRT-I in a community-based sample appears warranted.

Keywords: behavior therapy; cognitive therapy; insomnia; sleep disorders

INSOMNIA IS THE MOST PREVALENT sleep disorder, and it is characterized by problems initiating and/or maintaining sleep, and/or nonrestorative sleep, which

causes significant daytime impairment (American Psychiatric Association, 2000). A recent review estimated that between 6 and 10% of adults meet diagnostic criteria for the disorder (Roth, 2007). In addition to the diagnosis of insomnia, symptoms of the disorder are highly common; results from a 2011 population-based study revealed that 38% of adults in America had difficulty falling asleep and 68% either woke up during the night and/or woke up too early without being able to get back to sleep at least a few nights per week (National Sleep Foundation, 2011). Among those waking up during the night or too early, 16% were awake for at least 1 hour. The high rate of insomnia is concerning because the disorder has been shown to reduce quality of life, increase disability, and predict hypertension and psychiatric problems such as depression and substance abuse (Roth, 2007; Vgontzas, Liao, Bixler, Chrousos, & Vela-Bueno, 2009).

Studies investigating the causes of insomnia have highlighted the role of presleep thoughts and nighttime cognitive arousal. Though evidence links somatic arousal with insomnia across a number of biological measurements (Riemann et al., 2010), people with insomnia have been more likely to perceive nighttime cognitive arousal as opposed to somatic activity to be the determining factor for their sleep problems (Espie, Brooks, & Lindsay, 1989; Harvey, 2000; Lichstein & Rosenthal, 1980). Approximately 80% of individuals with insomnia reported an inability to “empty their mind” and “unwind their thinking” at bedtime (Harvey, 2000). The thought content of people with insomnia is considered worrisome, emotionally arousing, and focused on daily and future concerns, particularly of the consequences from difficulty sleeping (Espie,

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2002; Harvey, 2002). Indeed, a recent study that compared individuals with and without insomnia on a number of behaviors associated with the disorder showed that the only factor that was common among those with sleep problems was the frequency of “worry, planning, or thinking about important matters at bedtime” (Gellis & Lichstein, 2009). Although there has been debate as to whether arousing presleep cognitive activity is a cause or a mere correlate of insomnia, evidence for its contribution to chronic insomnia comes from clinical investigations showing that sleep quality improves as dysfunctional beliefs about sleep are reduced (Harvey, Sharpley, Ree, Stinson, & Clark, 2007; Morin, Blais, & Savard, 2002). In fact, Harvey et al. developed a treatment that uses behavioral experiments and Socratic questioning specifically designed to alter attention biases and dysfunctional beliefs related to sleep; this intervention demonstrated significant and large effects in the treatment of insomnia.

In addition to the role of negative, emotionally arousing thought content, emerging literature has shown that strategies used to cope with unwanted cognitions are related to insomnia. For instance, the use of cognitive distraction (i.e., attempts to replace unwanted thoughts with more pleasant content) has been shown to be negatively associated with insomnia, whereas worrisome or aggressive responses to unwanted cognitions were positively associated with insomnia (Ellis & Cropley, 2002; Ree, Harvey, Blake, Tang, & Shawe-Taylor, 2005; Schmidt, Gay, & Van der Linden, 2009). These findings regarding the positive role of cognitive distraction are consistent with those from the depression and anxiety literature. For example, experimental studies consistently showed that cognitive distraction tasks were successful in reducing affective distress in depressed individuals (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008) and have performed better than suppression in eliminating intrusive thoughts (Salkovskis & Campbell, 1994; Wegner, Schneider, Carter, & White, 1987). Further, interventions designed to help individuals shift attention away from threatening or intrusive environmental stimuli or thoughts have been shown to decrease anxiety and depression (Papageorgiou & Wells, 2000; Schmidt, Richey, Buckner, & Timpano, 2009; Wells, 1990). These investigations bring light to the varied mental health benefits of being able to refocus from unwanted or distressful thoughts.

Drawing on literature that highlights the usefulness of taking attention away from intrusive, negative thought content, a recently developed intervention termed cognitive refocusing treatment

for insomnia (CRT-I) attempts to directly manipulate presleep thought content, and an initial study assessing CRT-I in veterans with primary insomnia suggested that this technique showed promise to improve sleep (Gellis, 2012). In this intervention, the participant and therapist collaborate to identify an engaging cognitive task that does not induce emotional or physiologic arousal. This task involves focusing on any mental activity with enough scope and breadth to create multiple avenues of thought to maintain the interest and attention of the participant. Reasoning that continual effort attending to an engaging yet nonarousing cognitive task (e.g., thinking about a recent line of clothing or mentally reciting lyrics from their favorite music album) would allow people with insomnia to shift attention from emotionally arousing cognitions to nonarousing cognitions, and sleep would be improved. Allowing individuals to choose their own cognitive task is important in this intervention in order to maximize the likelihood that the individual will maintain interest and be able to focus on the task. In this technique, participants are instructed to focus on this task upon initiating sleep and when waking up during the night.

Other cognitive behavioral techniques for insomnia may also minimize intrusive and negative thoughts; this intervention is distinct from other techniques for a few reasons. For instance, paradoxical intention, an empirically supported treatment for insomnia, involves a behavioral recommendation to delay sleep as long as possible, and this strategy may minimize frustrating thoughts about the inability to sleep and the negative consequences of insomnia (Broomsfield & Espie, 2003). During relaxation training (also an empirically supported treatment for insomnia), individuals purposely focus on internal sensations or external stimuli, which may take attention away from intrusive thoughts. Further, a common recommendation in cognitive behavioral therapy for insomnia involves a wind-down period, in which individuals are advised to engage in relaxing or calming activities before bedtime. This period of calm activity may also induce a decrease in cognitive arousal before initiating sleep. In contrast to these interventions, CRT-I directly manipulates presleep cognitions and encourages refocusing to alternative cognitions, which may be more effective in reducing sleep-disturbing intrusive thoughts. Perhaps the most similar existing technique is imagery training, which involves shifting one's attention to a pleasant image. CRT-I, in contrast, involves focusing on a self-generated topic involving any cognitive task that is both engaging and nonarousing. It is reasoned that a self-identified topic of any mental activity would lead to increased interest and attention paid to the task,

and this would increase the chances of improved sleep.

In this investigation we further assessed the efficacy of CRT-I. In Gellis (2012), adherence was high and significant improvements over time were observed in sleep quality, insomnia severity, and various sleep parameters. That investigation, however, tested the intervention with a noncontrolled design using a small sample. Gellis (2012) also demonstrated preliminary effectiveness using a four-session format. In order to further evaluate CRT-I, this intervention plus sleep hygiene education (SH) was compared to a group composed of only SH. Because the majority of the treatment elements are delivered during the first session, we assessed the efficacy of a one-meeting format. The sample for this study was composed of university students, and insomnia severity and arousing thought content were assessed at baseline and 1-month posttreatment. It was hypothesized that those in CRT-I+SH would report less insomnia severity at posttreatment than the SH group. This intervention is presumed to improve sleep by reducing cognitive arousal at bedtime. It was also hypothesized that those in CRT+SH would report less cognitive arousal at posttreatment than the SH group.

Method

PARTICIPANTS AND PROCEDURES

Participants included students 18 years or older from introductory psychology classes in a private university in a northeast city of the United States. Data were collected during two consecutive semesters, and volunteers received class credit for participating in this investigation. The study was approved by the Institutional Review Board at the university. To be included in the study, participants were required to (a) score ≥ 8 on the Insomnia Severity Index (ISI; Bastien, Vallieres, & Morin, 2001); (b) have a complaint of insomnia for greater than 1 month; and (c) report wake after sleep onset, sleep onset latency, or early morning awakenings of greater than 30 minutes at least three nights per week for at least 1 month. This definition of insomnia is consistent with elements of a *Diagnostic and Statistic Manual of Mental Disorders* (DSM-IV) diagnosis of insomnia and quantitative criteria for insomnia (Lichstein, Durrence, Taylor, & Riedel, 2003), though DSM-IV criteria was not established from this assessment because we do not confirm the presence of daytime impairment related to insomnia. This information was gathered using a screening questionnaire completed by all introductory psychology students interested in participating in research. Participants were excluded if they reported

engaging in a different treatment for sleep disturbance after beginning the intervention.

Eligible volunteers scheduled a meeting via the Internet after reading a short description of the investigation online. The study description stated that volunteers "will be asked to complete questionnaires online, discuss sleep-related behaviors, and engage in behaviors and exercises at home that have been associated with improved sleep." After the volunteers scheduled a meeting, an e-mail notification was automatically sent to the primary investigator. The primary investigator then conducted simple randomization using a coin-tossing procedure in order to assign the volunteer to one of two groups: (a) CRT-I)+SH or (b) SH only. During both conditions, participants met individually with a therapist (a doctoral candidate in clinical psychology) for one session. During this meeting, informed consent was processed and participants subsequently completed baseline questionnaires via an online format. After completing the baseline measures, the therapist administered the assigned intervention. Participants completed posttreatment measures after 1 month and these measures were completed online at a place and time of their own convenience.

Figure 1 describes the flow of participants through the study. Among the 1,482 individuals completing the online screening, 251 met study criteria. Among these 251 students, 62 scheduled a meeting and were randomized into a study group. Two individuals, both randomized into CRT-I+SH, cancelled their appointment for unknown reasons. After completing baseline questionnaires, two participants were subsequently eliminated because they no longer complained of sleep difficulties (both randomized into the CRT-I+SH group) and one person (randomized into the SH group) was disqualified due to receiving a pharmacologic treatment for insomnia directly after the intervention. Seven individuals withdrew after completing the baseline measures and receiving the intervention and did not complete the posttreatment evaluation (three individuals from CRT-I+SH and four from SH). All of these individuals were enrolled during the first semester. The lower attrition rate during the second semester was likely because of systematic rule changes preventing students from signing up for more credits than they require, increasing the incentive to complete the second portion of two-part studies.

Students participated in research to satisfy a class requirement; thus, we did not recruit a treatment-seeking group. However, we attempted to select individuals truly interested in help for their sleep problem. At posttreatment, participants were asked

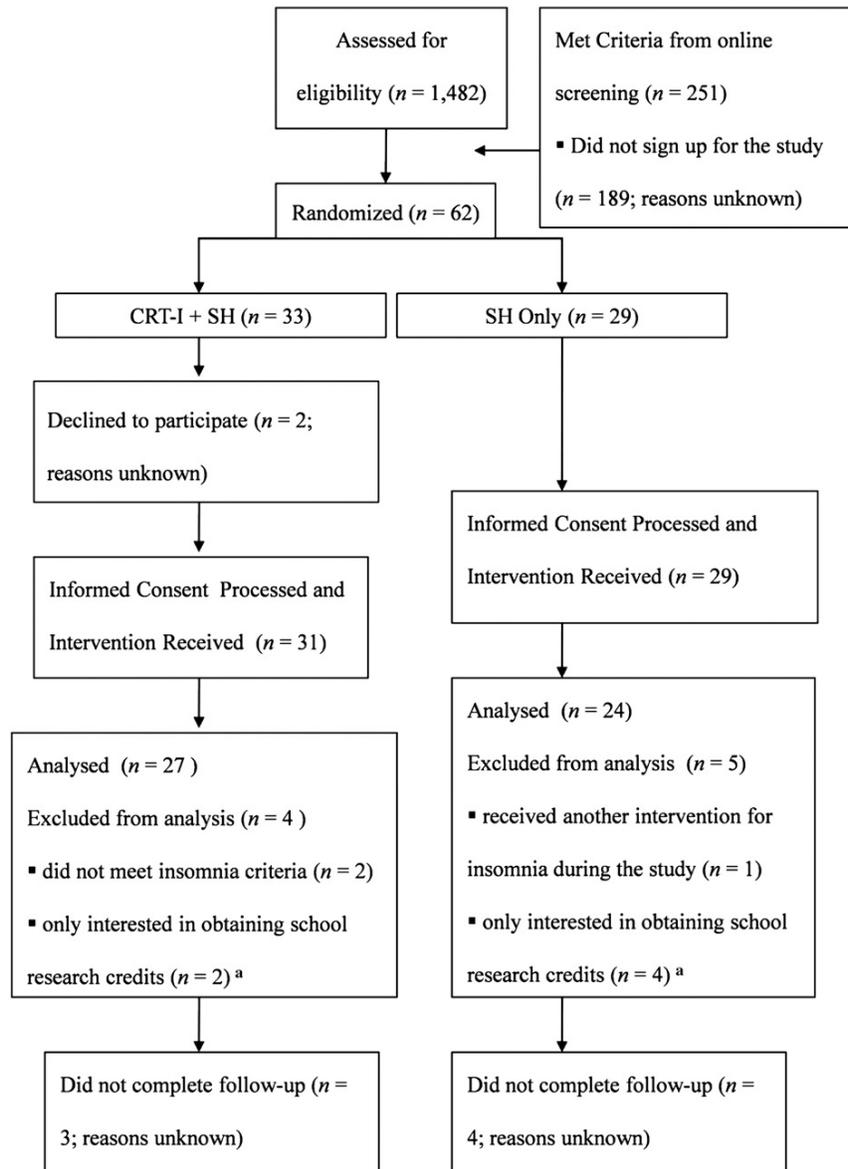


FIGURE 1 Study flowchart. ^a We conducted analyses with and without these participants. An Appendix presents the main findings using all participants.

to respond as to whether they participated in this investigation because they were only interested in credits to satisfy requirements for the class or whether they were actually interested in treatment for sleeping difficulty. Of those completing post-treatment data, 6 (12%) out of 50 admitted that they were only interested in the research credits, and these individuals were eliminated from analyses. Among those eliminated, 2 were assigned to the CRT-I+SH group and 4 were in the SH condition. The final sample consisted of 51 individuals, and 44 participants completed baseline and posttreatment

measures. Refer to [Table 1](#) for the sample characteristics.

Though the sample is composed of university students, they showed characteristics consistent with adult community members complaining of insomnia. Participants were mostly female (65%); moderately depressed, Patient Health Questionnaire-9 (PHQ-9; [Kroenke, Spitzer, & Williams, 2001](#)) $M=10.1$, $SD=4.8$; mildly anxious, generalized anxiety disorder (GAD-7; [Spitzer, Kroenke, Williams, & Löwe, 2006](#)) $M=9.2$, $SD=4.7$; and showed insomnia severity totals consistent with clinical insomnia,

Table 1
Final Baseline Sample Characteristics

Measure	CRT-I+SH n=27	SH n=24	Total N=51	Group Comparison
Gender				$\chi^2=2.2, p=.138$
Male	7 (25.9%)	11 (45.8%)	18 (35.3%)	
Female	20 (74.1%)	13 (54.2%)	33 (64.7%)	
Race/Ethnicity				$\chi^2=1.4, p=.232^a$
White	17 (65.4%)	19 (79.2%)	36 (72.0%)	
Asian	5 (19.2%)	3 (12.5%)	8 (16.0%)	
Non-white Hispanic	2 (7.7%)	1 (4.3%)	3 (6.0%)	
African American	2 (7.7%)	0 (0.0%)	2 (4.0%)	
Insomnia Severity	15.3 (3.3)	16.8 (3.5)	16.0 (3.5)	$t(49)=1.6, p=.117$
Depression Severity	8.6 (3.2)	11.7 (5.8)	10.1 (4.8)	$t(35)=2.3, p=.028$
Depression Severity ^b	6.5 (2.6)	9.5 (5.4)	7.9 (4.4)	$t(32)=2.5, p=.017$
Anxiety Severity	7.9 (3.7)	10.6 (5.3)	9.2 (4.7)	$t(49)=2.1, p=.038$
Sleep Hygiene	44.0 (12.8)	44.1 (10.3)	44.0 (11.6)	$t(49)=0.0, p=.994$

Note. Group comparisons were conducted by chi-square tests of independence for categorical variables and independent sample *t* tests for continuous measures.

^a The group comparison of race/ethnicity included white versus non-white.

^b Depression severity subtracting the sleep item.

M ISI=16.0, *SD*=3.5. Using the cutoffs for the PHQ-9 and the GAD-7, 27 (53%) of the sample met criteria for major depression (PHQ-9 score ≥ 10) and 21 (41%) of the sample met the cutoff for identifying generalized anxiety disorder (GAD-7 score ≥ 10). These rates of anxiety and depression are within the range, on the higher end, of those observed in people with insomnia seeking psychiatric or sleep-related care (Harvey, 2001; Perlis, Sharpe, Smith, Greenblatt, & Giles, 2001).

Cognitive Refocusing Treatment for Insomnia

Participants were given a handout describing the procedures and rationale of the refocusing technique, and these details were read aloud by the treatment provider. This discussion highlighted the importance of changing thought content from physiologically and emotionally arousing thoughts to nonarousing thoughts in order to improve sleep. Participants were encouraged to ask questions to clarify the intervention instructions.

Next, the provider worked with the participant to identify three different categories of thought (topics of thought content) compelling enough to maintain his or her attention at bedtime. For instance, an individual may think about new dinner recipes or plots from his or her favorite television programs. These chosen thought categories were to have the following two qualities: (a) emotionally and physiologically nonarousing, and (b) compelling and engaging. An emotionally and physiologically nonarousing category was indicated by thought content devoid of emotion-laden, negative, exciting, or worrisome content.

For this procedure the participant was asked to become absorbed in or focus attention on one of the categories at bedtime and upon waking up during the evening. If thought content other than the specific categories came to mind during the evening, participants were instructed to let go of or take attention away from that content and focus their attention on their chosen topic. Upon awakening during the evening, participants were instructed to avoid looking at the clock or any other activity that would take their attention from their targeted thought content. Individuals chose the type of categories that would be focused on during the evening. Three categories were identified by the participant. They were instructed to pay attention to whether their thought processes elicited emotional or physiologic arousal, and they were encouraged to switch topics if the first-chosen thought content precipitated arousal or if it was not engaging enough to occupy their attention. However, they were encouraged to focus on one thought category in order to develop learned associations between a specific category and sleep. The average duration for this combined intervention was approximately 30 minutes.

Sleep Hygiene Education

An SH group was used as an active control for time and placebo effects. SH has been shown to have good credibility ratings (Edinger & Sampson, 2003), yet limited efficacy as an independent intervention for insomnia (Morin et al., 2006). Recommendations for SH involved suggestions to change or eliminate behaviors associated with poor sleep. They were encouraged to avoid usage of caffeine after noon,

keep the bedroom dark when attempting to sleep, eliminate exercise 2 hours before bedtime (although exercise during the day was encouraged), avoid heavy meals and nicotine within 2 hours of bedtime, and avoid alcohol after dinner. In addition to these recommendations, participants were encouraged to avoid the bed and bedroom at all times during the day except for sleep and sex. Each recommendation was discussed in detail. This discussion included explanations of the rationale for each behavior, problem solving, and suggestions to improve adherence. The average duration for this intervention was approximately 15 minutes.

MEASURES

Insomnia Severity

The ISI (Bastien et al., 2001) was used to assess insomnia severity. The ISI measured subjective insomnia severity during the previous 2 weeks. The measure included seven questions, and scores ranged from 0 to 28. The ISI is a recommended assessment of insomnia severity (Buysse, Ancoli-Israel, Edinger, Lichstein, & Morin, 2006) that has demonstrated sensitivity to change in response to treatment (Bastien et al., 2001). In the current sample, internal consistency was acceptable ($\alpha = .70$). Consistent with Bastien and colleagues' recommendation, a cutoff of ≥ 8 was used to identify sleep disturbance.

Nighttime Hyperarousal

The Pre-Sleep Arousal Scale (PSAS; Nicassio, Mendlowitz, Fussell, & Petras, 1985) was used to assess nighttime arousal. The PSAS is a 16-item measure assessing both cognitive (e.g., can't shut off your thoughts) and somatic (e.g., a tight, tense feeling in your muscles) components of arousal at bedtime. The PSAS measured how intensely an individual experienced these components of arousal for the past 2 weeks as he or she attempted to fall asleep. There were eight items measuring both cognitive and somatic arousal, and response options for each item ranged from 1 (*not at all*) to 5 (*extremely*). Two subscales (cognitive and somatic) were computed and scores from each scale ranged from 8 to 40 (higher score indicated greater arousal). In the current sample, internal consistency was acceptable for somatic ($\alpha = .73$) and cognitive ($\alpha = .85$) arousal.

Treatment Credibility

Two items from the Treatment Evaluation Questionnaire (Borkovec & Nau, 1972) were used to assess treatment credibility, and these items were completed at posttreatment. These items were chosen because they appeared less likely to be

affected by treatment success or failure, though it remained possible that treatment response biased these findings. Participants reported whether they felt the treatment was logical and reasonable and whether they would recommend the intervention to a friend with a similar problem. The items were measured on a Likert scale ranging from 0 (*strongly disagree*) to 5 (*not sure*) to 10 (*strongly agree*).

Depression

The PHQ-9 was used to assess depression severity (Kroenke et al., 2001). Participants reported how often they experienced each of the nine symptoms for a major depressive episode (0 = *not at all*, 3 = *nearly every day*) during the previous 2 weeks, and scores on the measure ranged from 0 to 27. For analyses, the item assessing insomnia or hypersomnia was subtracted from the depression severity total, and this total was termed "nonsleep depression." A score of ≥ 10 , which indicates at least moderate depression, had a sensitivity and specificity of 88% for identifying major depression (Kroenke et al., 2001).

Anxiety

Anxiety severity was assessed by the GAD-7. The GAD-7 is a seven-item scale measuring generalized anxiety over the previous 2 weeks (Spitzer et al., 2006). Participants reported how often they are bothered by seven symptoms of anxiety on a scale ranging from 0 (*not at all*) to 3 (*nearly every day*), and the total score potentially ranged from 0 to 21. A score of ≥ 10 , which indicates at least moderate anxiety, showed good sensitivity (89%) and specificity (82%) for identifying generalized anxiety disorder (Spitzer et al., 2006).

Adherence and Enactment

Investigator-designed measures were used to assess the adherence and enactment of treatment. These measures were assessed at posttreatment. To assess adherence, CRT-I participants were asked "In the past 2 weeks, how many nights did you attempt to shift your attention by focusing on categories of interest?" To assess one's ability to perform the treatment, CRT-I participants were asked to judge their ability to perform the task on a scale ranging from 1 (*the task was extremely easy*) to 10 (*the task was extremely hard*). Participants were also asked to evaluate whether their thought categories of interest matched the components of adaptive nighttime thought content (i.e., emotionally non-arousing yet engaging). For example, participants were asked to respond as to whether their chosen task was "interesting and engaging" on a scale ranging from 1 (*the task was extremely interesting and engaging*) to 10 (*the task was extremely not*

interesting and unengaging). They were also asked whether their cognitive task was emotionally neutral (nonarousing) or worrisome, exciting, or associated with arousal; scores ranged from 1 (*the task was extremely emotionally neutral* [nonarousing]) to 10 (*the task was extremely worrisome, exciting, or associated with arousal*). Sleep hygiene adherence was assessed as the number of days in which the participant followed each recommendation over the previous 2 weeks.

ANALYSIS PLAN

Analyses were conducted using SPSS version 18. An intent-to-treat model was used to analyze data, by using multilevel modeling (Raudenbush & Bryk, 2002). Multilevel modeling (also known as hierarchical modeling or linear mixed modeling) is particularly appropriate for these analyses because it can (a) deal with dependency of repeated measurements that are nested within each individual, and (b) accommodate missing data instead of excluding individuals without follow-up data. A separate multilevel model with Two Treatment Groups (CRT-I+SH and SH) \times Two Time Points (baseline and follow-up) was conducted for each of three outcome variables: insomnia severity, cognitive arousal, and somatic arousal. All predictors were included as fixed effects. The significance test of a Treatment Group \times Time interaction term served as a significance test for the treatment effect. Covariates included relevant baseline characteristics not equivalent between groups at baseline. Independent sample *t* tests for continuous measures and χ^2 analyses for categorical variables were used to determine covariates. Because of the relatively small sample, a $p < .1$ was used to select covariates. Within-group ($M_{\text{baseline}} - M_{\text{posttreatment}}/SD_{\text{pooled}}$) and between-group ($M_{\text{posttreatment1}} - M_{\text{posttreatment2}}/SD_{\text{pooled}} - (M_{\text{baseline1}} - \text{baseline2}/SD_{\text{pooled}})$) Cohen's *d* (Cohen, 1988) was used to assess clinical effect, and adjusted means were used to compute effect sizes. A six-point change in ISI scores identified clinically meaningful improvement (Yang, Morin, Schaefer, & Wallenstein, 2009). An a priori power analysis was conducted using G*Power. Results indicated that 45 participants were needed to achieve a power level of $> .8$, with an alpha level set at $.05$, assuming a medium effect size, for a repeated measures ANOVA Group \times Time interaction.

Results

TREATMENT ADHERENCE, ENACTMENT, AND CREDIBILITY

Participants agreed that CRT-I+SH was a reasonable and logical treatment for insomnia ($M = 7.2$, $SD = 1.8$) and would recommend the treatment to

a friend experiencing the same problems ($M = 7.4$, $SD = 2.5$). Participants of the SH group also viewed the treatment as reasonable and logical ($M = 6.8$, $SD = 1.5$) and would recommend this intervention to a friend ($M = 6.5$, $SD = 1.8$). Independent samples *t* tests showed no statistical differences between CRT-I+SH group and the SH condition on credibility ratings (p values ranged from $.479$ to $.210$). The CRT-I+SH group shifted their attention to focus on categories of interest on 8.9 ($SD = 4.0$) nights out of 14 . The mean ability score for the cognitive task was 4.6 ($SD = 2.0$), the average arousal score for the chosen cognitive task was 3.1 ($SD = 1.9$), and the average interest score for the chosen cognitive task was 4.8 ($SD = 2.2$). Independent samples *t* tests showed no differences between groups in regard to adherence of sleep hygiene behaviors (p values ranged from $.148$ to $.977$).

CATEGORIES OF THOUGHT EXAMPLES

Various thought categories were chosen by participants. Categories included thinking about a future travel itinerary, mentally reciting lyrics from the musical "Rent," planning volleyball strategies, thinking about plotlines from their favorite television programs, thinking about scenes from the movie *Rocky*, imagining walking through the woods, reciting the plan of preparing for the beach, and imagining oneself boating and hiking.

BASELINE CHARACTERISTICS AND COVARIATE SELECTION

There were 27 (53%) individuals randomly assigned to the CRT-I+SH group and 24 (47%) persons assigned to the SH condition. See Table 1 for group characteristics and statistical comparisons between conditions. Randomization did not achieve complete baseline equivalence on relevant mental health variables. Results of independent sample *t* tests revealed greater baseline depression severity, $t(35) = 2.3$, $p = .028$; nonsleep depression severity, $t(32) = 2.5$, $p = .017$; and anxiety severity, $t(49) = 2.1$, $p = .038$, among the SH group as compared to the CRT-I+SH group.

INSOMNIA SEVERITY

Adjusted mean scores for baseline and follow-up insomnia severity and effect sizes are presented in Table 2. Analyses showed a significant Group \times Time interaction in relation to insomnia severity, $F(1, 46) = 5.1$, $p = .03$, after controlling for baseline anxiety and nonsleep depression. These results suggested greater improvement over time in the CRT-I+SH group as compared to the SH condition. There was a large within-group effect size for CRT-I+SH ($d = 1.57$)

and for the SH group ($d=0.81$). Between-group effect sizes after subtracting pretreatment differences revealed a medium effect ($d=0.60$) for the CRT-I intervention. A clinically meaningful response (ISI change ≥ 6) was more likely to occur in the CRT-I+SH group (46%) than the SH group (20%). Those in the CRT+SH group were significantly more likely to have a clinically meaningful response ($p=.04$, odds ratio=4.8, CI=1.1, 22.0), after controlling for baseline insomnia severity. Mean scores for baseline and follow-up insomnia severity and effect sizes for the sample including individuals that reported only being interested in course can be found in the Appendix.

NIGHTTIME AROUSAL

Mean scores for baseline and follow-up cognitive and somatic arousal and effect sizes are presented in Table 2. Analyses showed a trend for a Group \times Time interaction in relation to cognitive arousal, $F(1, 46)=3.4$, $p=.07$, after controlling for baseline anxiety and depression. These results suggested less cognitive arousal over time for CRT-I+SH as compared to SH. There was a large within-group effect for CRT-I+SH (Cohen's $d=1.13$) and a medium effect for SH ($d=0.45$). The between-group effect size after subtracting pretreatment differences revealed a medium effect ($d=0.48$). There was no Group \times Time interaction involving somatic arousal, $F(1, 46)=0.8$, $p=.37$. There was a small decrease in somatic arousal over time for CRT+SH ($d=0.23$) and no effect for the SH group ($d=0.08$). Mean scores for baseline and follow-up cognitive and somatic arousal and effect sizes for the sample including the individuals who reported only being interested in course credit are reported in the Appendix.

Discussion

This investigation tests the efficacy of a novel brief cognitive intervention for insomnia. This intervention is designed to help individuals refocus from sleep-disturbing thoughts to alternative and more adaptive thought content. At 1 month posttreatment, CRT-I adds a statistically significant and medium clinical effect after accounting for a sleep hygiene control group. Caution should be given in considering the generalizability of these findings to the general population with insomnia, because the sample consisted of college students. However, these results are consistent with the positive findings from Gellis (2012) and lend continued support for CRT-I.

It is hypothesized that this intervention allows the person with insomnia to refocus from intrusive presleep cognitions, resulting in decreased cognitive arousal. A trend for a Group \times Time interaction suggests decreased cognitive arousal at bedtime for those receiving CRT-I and within-group d reveals a large effect. The reduction of cognitive arousal along with the improvement in sleep suggests that the intervention changes presleep cognitions, which, in turn, assists in the initiation of sleep. Evidence for this hypothesis is consistent with the difference in effect between cognitive arousal and somatic arousal. While there was a large decrease in cognitive arousal, there was only a small decrease in somatic arousal over time. It should be noted that a medium decrease in cognitive arousal also occurs in the SH group. Thus, it is also possible that this decrease in cognitive arousal occurs as an artifact of sleep improvement.

The results from this study extend the findings from Gellis (2012) using a one-session intervention

Table 2
Adjusted Means, Standard Error, and Effect Sizes for Insomnia Severity, and Nighttime Arousal at Baseline and Follow-Up

Measure	CRT-I+SH <i>n</i> =27			SH <i>n</i> =24		
	Baseline <i>M</i> (<i>SE</i>)	Follow-Up <i>M</i> (<i>SE</i>)	Cohen's <i>d</i>	Baseline <i>M</i> (<i>SE</i>)	Follow-Up <i>M</i> (<i>SE</i>)	Cohen's <i>d</i>
ISI	15.7 (0.57)	10.2 (0.77)	1.57	16.1 (0.62)	13.2 (0.85)	0.81
PSAS						
Cognitive	25.3 (0.84)	18.9 (1.33)	1.13	26.1 (0.90)	23.5 (1.45)	0.45
Somatic	15.8 (0.78)	14.7 (1.04)	0.23	16.2 (0.84)	16.6 (1.14)	0.08

Note. CRT-I = cognitive refocusing treatment for insomnia; SH = sleep hygiene education; ISI = Insomnia Severity Index; PSAS = Pre-Sleep Arousal Scale; Cohen's d is based on baseline and follow-up differences. All values are based on multilevel models that adjusted for nonsleep depression (in the model for the ISI) and depression (in the models for the PSAS), as well as anxiety (for all models).

as compared with the original four-session version of CRT-I. Improvement in insomnia severity for the four-session intervention was better than the improvement in this study (within-group d was 1.93 as compared to 1.55) and the intervention for Gellis (2012) does not include any additional sleep recommendations. The posttreatment differences between studies could be explained by sample discrepancies. For instance, Gellis (2012) uses a smaller sample, and those results may not be as reliable as the findings from this study. The present study also does not exclude other sleep disorders that may be disrupting sleep, whereas the participants in Gellis (2012) were selected for having primary insomnia. Thus, problems such as parasomnias and circadian rhythm disorders masked as insomnia may have limited treatment gains in this current study. It is also plausible that more sessions of CRT-I contributes to a greater treatment effect. This final hypothesis is consistent with other values that are different between Gellis (2012) and this study. Adherence was greater in the previous study (89% of days) as compared to this investigation (63% of days), as was ability with the task (3.7 as compared to 4.6). The second through fourth sessions were short for the majority of individuals in the four-meeting format, but these extra sessions may have been useful for some individuals who require more encouragement, do not initially achieve positive results, or have difficulties identifying appropriate thought content in a relatively short period of time.

Findings from this study are comparable to results generated from cognitive behavioral treatment for insomnia. A recent study testing cognitive behavioral treatment for insomnia (CBT-I) in college students using an 8-week e-mail-delivered protocol found a posttreatment effect of 1.33 in the Pittsburgh Sleep Quality Index (Troczel, Manber, Chang, Thurston, & Taylor, 2011). Though these comparisons are limited because the studies differ on important methodology, they suggest that this brief administration of CRT-I can provide somewhat similar symptom relief when compared to CBT-I.

In this investigation both groups received sleep hygiene instructions and only one of the conditions was given CRT-I. An advantage of this design includes the ability to detect the effects attributed to CRT-I over and above standard sleep recommendations. However, a weakness of this investigation includes the inability to control for the therapy time. It is possible that gains attributed to CRT-I may be because of the increase in time spent with the therapist. This study is also unable to detect the credibility that is attributed to CRT-I. Though the acceptability appeared high in the CRT-I+SH group, this finding may have been related to the

effect of sleep hygiene recommendations. Indeed, there were no significant differences in credibility between the two groups. Future studies should assess the individual patient acceptance of CRT-I. Equal credibility ratings between the SH group and CRT-I+SH also reflect positively on the use of the SH group as an active control in this population. Indeed, a large effect was observed for SH, which is not considered an efficacious intervention for insomnia. These sleep improvements could have been related to time or placebo effects; however, little is known about the effect of SH in college students. This population may have environmental and lifestyle circumstances that make them susceptible to problems associated with sleep hygiene behaviors, and changing these behaviors may potentially improve sleep.

Of interest, the intervention stresses the consistency of thought category in the bedroom. Consistency is encouraged to help develop learned associations among these thought categories, the bedroom, and sleep to increase the likelihood that the bedroom will become a cue for engaging in this thought process as opposed to more negative, arousing thoughts. In addition, with repeated associations with sleep onset, specific categories may become associated with sleep, thereby strengthening their stimulus value to provide good stimulus control. If this process is indeed part of treatment effectiveness, greater improvements would be achieved over time, as was observed in Gellis (2012). Unfortunately, the design in this investigation does not allow for such observations. Future studies should assess whether consistency of a thought process is an important factor affecting refocusing. In fact, it is possible that by changing tasks individuals may be more likely to maintain interest and attention on the mental content, which may further improve sleep.

This study includes several limitations that should be considered. First, this intervention uses a sample composed of college students. Though participants report mental health problems consistent with insomnia and note being genuinely interested in treatment for their sleep problem, it is not clear if these results would generalize to a community-based clinical sample. However, it should be noted that the potential inclusion of other sleep and psychiatric disorders increases the generalizability of this sample, as the majority of those with insomnia have other significant health problems. Of note, we did not screen participants for delayed sleep phase syndrome, which may be common in this age range. The potential inclusion of individuals with this syndrome may have lessened the response to the interventions or led to artificial treatment gains if participants were evaluated during periods in which they were given

greater opportunities to sleep late. Second, we measure subjective insomnia and adherence to treatment retrospectively, and these assessments may not have been as valid as continuous measurements taken daily throughout the period. Third, though we excluded individuals who began a sleep-focused intervention after initiating treatment, we did not eliminate individuals who began an intervention prior to the study that may have had delayed effects (such as initiating a trial of anti-depressants), and we did not collect information on concurrent psychotherapy and sleep medication usage. The usage of other interventions either before or during the intervention may have influenced the intervention response and we do not know whether these treatments were differentially used between groups. Finally, we assessed treatment enactment; however, we did not evaluate treatment fidelity. Thus, it is possible that therapist bias or treatment elements other than the assigned interventions were incorporated into the sessions. Though therapist impartiality was discussed during weekly supervision meetings with study therapists, treatment fidelity was not empirically examined.

Though there are limitations to the current study, it appears that CRT-I shows promise to improve sleep in those with insomnia symptoms. Gellis (2012) demonstrated significant and large effect sizes in a veteran sample and this study extends these findings with a group of sleep-disturbed college students. These findings, along with previous research, suggest that future studies are warranted to test this intervention. In particular, it would be useful to assess the relative efficacy of interventions that reduce intrusive thoughts using a community-based sample diagnosed with chronic insomnia. It would also be useful to compare the intervention to CBT-I or in combination with CBT-I.

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Appendix A

Adjusted Means, Standard Error Values, Effect Sizes, and Significance Testing for Insomnia Severity and Nighttime Arousal at Baseline and Follow-Up Including the Nontreatment Seekers

Measure	CRT-I+SH n=29			SH n=28			Significance Testing
	Baseline M (SE)	Follow M (SE)	Cohen's d	Baseline M (SE)	Follow M (SE)	Cohen's d	
ISI	15.5 (0.57)	10.0 (0.74)	1.55	16.5 (0.59)	13.3 (0.77)	0.89	$F(1, 52)=4.2, p=.04$
PSAS							
Cognitive	25.5 (0.80)	18.9 (1.34)	1.15	26.8 (0.82)	23.5 (1.39)	0.56	$F(1, 52)=2.7, p=.10$
Somatic	16.0 (0.72)	14.8 (1.01)	0.26	16.3 (0.74)	16.7 (1.05)	0.08	$F(1, 52)=1.1, p=.31$

Note. CRT-I=cognitive refocusing treatment for insomnia; SH=sleep hygiene education; ISI=Insomnia Severity Index; PSAS=Pre-Sleep Arousal Scale; Cohen's d is based on baseline and follow-up differences. Significance tests are the Group × Time interaction tests from multilevel models. Values include the entire sample including individuals who reported being interested only in the credits.

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