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Effects of Integrated Telehealth-Delivered Cognitive-Behavioral Therapy for Depression and Insomnia in Rural Older Adults

Forrest Scogin and Kenneth Lichstein
University of Alabama

Elizabeth A. DiNapoli
Veterans Affairs Pittsburgh Healthcare System, Pittsburgh, Pennsylvania

Julie Woosley
Tuscaloosa Veterans Affairs Medical Center, Tuscaloosa, Alabama

S. Justin Thomas
The University of Alabama at Birmingham

Michael A. LaRocca
Veterans Affairs Palo Alto Healthcare System, Palo Alto, California

Haley D. Byers
Kaiser Permanente, Atlanta, Georgia

Lisa Mieskowski, Christina Pierpaoli Parker, Xin Yang, Jason Parton, and Anna McFadden
University of Alabama

James D. Geyer
Alabama Neurology and Sleep Medicine, Tuscaloosa, Alabama

We examined the effects of integrated cognitive-behavioral therapy for depression and insomnia (CBT-D + CBT-I, respectively) delivered via videoconference in rural middle-aged and older adults. Forty patients with depressive and insomnia symptoms were randomized to receive either 10 sessions of CBT-D + CBT-I or usual care (UC). Patients in the integrated CBT condition were engaged in telehealth treatment through Skype at their primary care clinic. Assessments were conducted at baseline, posttreatment, and 3-month follow-up. CBT-D + CBT-I participants had significantly greater improvements in sleep at posttreatment and 3-month follow-up as compared with the UC participants. The Time × Group interaction for depression was not significant; participants in both the CBT-D + CBT-I and UC conditions showed a decrease in depressive symptoms over time. Although integrated CBT benefits both depression and

Forrest Scogin and Kenneth Lichstein, Department of Psychology, University of Alabama; Elizabeth A. DiNapoli, VISN 4 Mental Illness Research, Education and Clinical Center, Veterans Affairs Pittsburgh Healthcare System, Pittsburgh, Pennsylvania; Julie Woosley, Tuscaloosa Veterans Affairs Medical Center, Tuscaloosa, Alabama; S. Justin Thomas, Department of Epidemiology, The University of Alabama at Birmingham; Michael A. LaRocca, Veterans Affairs Palo Alto Healthcare System, Palo Alto, California; Haley D. Byers, Southeast Permanente Medical Group, Kaiser Permanente, Atlanta, Georgia; Lisa Mieskowski and Christina Pierpaoli Parker, Department of Psychology, University of Alabama; Xin Yang and Jason Parton, Culverhouse College of Commerce and Business Administration, University of Alabama; Anna McFadden, College of Human Environmental Sciences, University of Alabama; James D. Geyer, Alabama Neurology and Sleep Medicine, Tuscaloosa, Alabama.

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Correspondence concerning this article should be addressed to Forrest Scogin, Department of Psychology, University of Alabama, Tuscaloosa, AL 35487-0348. E-mail: fscogin@ua.edu

insomnia symptoms, its effects on depression are more equivocal. Further research should consider expanding the depression treatment component of integrated CBT to enhance effectiveness.

Keywords: integrated CBT, telehealth, depression, insomnia, middle-aged and older adults

Estimates suggest that insomnia prevalence grows with advancing age, rising to more than 30% among those aged 65 and older (Lichstein & Morin, 2000). Typically, symptomatic adults often have chronic medical conditions and comorbid psychiatric disorders accompanying their insomnia (Ancoli-Israel & Cooke, 2005; Foley, Ancoli-Israel, Britz, & Walsh, 2004; Ohayon, 2002). For example, approximately 30-35% of middle-aged and older adults with insomnia will also have depressive symptoms or a depressive disorder (Livingston, Hawkins, Graham, Blizard, & Mann, 1990; Mallon & Hetta, 1997). From clinical and epidemiological perspectives, this association between insomnia and depression raises concerns because of its links to a catalogue of poor health outcomes, including: increased morbidity and mortality, cognitive impairment, decreased quality of life, functional impairment, and increase in health care use (Ancoli-Israel & Cooke, 2005; Harsora & Kessmann, 2009; McCall, Reboussin, & Cohen, 2000; Sutter, Zöllig, Allemand, & Martin, 2012; Walsh, 2004).

Insomnia and depression are intimately connected and share several intersection points: (1) Insomnia is a high risk factor for subsequent depression (Breslau, Roth, Rosenthal, & Andreski, 1996; Perlis et al., 2006); (2) treating either one prompts partial improvement in the other (Taylor, Lichstein, Weinstock, Sanford, & Temple, 2007; Yon et al., 2014); (3) disturbed sleep moderates depression treatment (Dew et al., 1997); (4) treatment of either one leaves residual symptoms of the other (Lichstein, Wilson, & Johnson, 2000; Nierenberg et al., 1999); and (5) residual subjective poor sleep beckons depression relapse (Buysse et al., 1996). Conceivably that providing treatments that are sensitive to comorbid depression and insomnia may maximize outcomes in adults (Fava et al., 2006; Manber et al., 2008).

Although several psychotherapies have sufficient evidentiary support, cognitive–behavioral therapy for depression (CBT-D) is the most thoroughly investigated psychological treatment for late-life depressive symptoms (Scogin, Welsh, Hanson, Stump, & Coates, 2005). Similarly, learning-based approaches such as cognitive–behavioral therapy for insomnia (CBT-I) and briefer variants such as brief behavioral treatment for insomnia (BBTI) are recommended as first-line treatment for insomnia (Buysse et al., 2011; Harsora & Kessmann, 2009). Preliminary evidence has suggested that augmenting depression treatment (antidepressant medication and CBT-D) with insomnia treatment (BBTI and CBT-I) in individuals with depression and comorbid insomnia is a promising approach to alleviating both depressive symptoms and sleep disturbances (Manber et al., 2008). Although CBT-D and brief behavioral treatments for insomnia have individually been shown to have beneficial effects in rural, older adults (McCrae, McGovern, Lukefahr, & Stripling, 2007; Scogin et al., 2007), unknown is whether the combination of CBT-D and CBT-I is effective in this population. For example, very few studies have examined the effectiveness of these or related treatments among rural-dwelling middle aged and older adults (i.e., older adults living in rural counties and lacking access to geriatric mental health services). In one of the only randomized trials of a psychological treatment among rural older adults, Scogin et al. (2007) found that a home-delivered CBT intervention improved quality of life and psychological symptoms among this population.

This is concerning because upward of 8 million older adults live in rural communities (Baernholdt, Yan, Hinton, Rose, & Mattos, 2012). Unfortunately, adults living in rural areas who experience co-occurring depression and insomnia are particularly underserved, largely because of inaccessible care (Ngui, Khasakhala, Ndetei, & Roberts, 2010). For instance, rural-dwelling middle-aged and older adults must often face significant challenges tied to poverty, geographic and social isolation, and lack of available providers (Gale & Heady, 2013). Telehealth, or telemedicine, offers a promising

way to provide quality mental health care to rural, adults who otherwise would not have access to it (Hopps, Pepin, & Boisvert, 2003; Rees & Haythornthwaite, 2004). Recent research studying the delivery of CBT through videoconferencing for depression and insomnia has shown similar outcomes to face-to-face therapy (McCarthy, 2016; Ruskin et al., 2004; Zhou, Li, Pei, Gao, & Kong, 2016). But largely unaddressed is how effectively integrated, videoconference-delivered CBT-D + CBT-I works for rural-dwelling, medically underserved middle-aged and older adults with insomnia and depression.

A preceding pilot study examined the feasibility, acceptability, and preliminary effectiveness of using videoconferencing CBT-D + CBT-I to treat rural adults with comorbid symptoms of depression and insomnia (Lichstein et al., 2013). A total of five participants received 10 sessions of integrated CBT-D + CBT-I via Skype at their primary care clinic. Participants exhibited clinically significant improvements in both insomnia (sleep diaries and Insomnia Severity Index [ISI]; Carney et al., 2012; Morin, 1993) and depressive symptoms (Hamilton Rating Scale for Depression [HAM-D]; Hamilton, 1960) at posttreatment, and these gains were well maintained at 2-month follow-up. Results also revealed that working alliance for videoconferencing CBT-D + CBT-I was comparable to that of face-to-face therapy (Lichstein et al., 2013). Patients consistently reported comfort with using a computer and interacting with a therapist via Skype; additional information on the technological feasibility is provided in the preceding pilot article (Lichstein et al., 2013). Overall, results suggest that using videoconferencing to deliver depression and insomnia treatment to rural, middle-aged and older adults appears feasible, acceptable, and well tolerated, even among otherwise technologically unsavvy patients. Thus, the current study presents findings from a subsequent pilot randomized, controlled trial (RCT) which assessed the effectiveness of using videoconferencing to deliver integrated CBT-D + CBT-I for rural medically vulnerable adults with comorbid symptoms of depression and insomnia. We hypothesized that depressive symptoms (HAM-D) and sleep quality (ISI) would have significantly greater improvements from baseline to posttreatment for those receiving CBT-D + CBT-I relative to those receiving usual care (UC) in the control condition.

Method

Participants

Several recruitment methods, including physician and nurse referrals, medical record surveys, and administration of brief waiting room questionnaires, were applied to identify prospective patients. Participant inclusion criteria included: (1) being 50 years of age or older; (2) a resident of Alabama's Black Belt (part of the larger Southern Black Belt, a crescent-shaped region in the Southern United States originally named for its fertile, dark soil) or adjacent counties (financially disadvantaged, rural Alabama) and receiving services from one of our five primary care collaborators; (3) absence of significant cognitive impairment as indicated by a score of 20 or higher on the Saint Louis University Mental Status Examination (SLUMS; Tariq, Tumosa, Chibnall, Perry, & Morley, 2006); (4) absence of other sleep disorders such as apnea as determined by interview; (5) not currently receiving psychological treatment; (6) absence of suicidality; (7) absence of a self-reported psychotic disorder or substance dependence or abuse; and (8) concurrence from patient's primary care physician indicating presence of both insomnia and depression symptoms of sufficient significance to warrant initiation or continuance of primary care treatment.

A G*power analysis using a slightly larger than medium effect size ($d = .6$) determined sample size (Faul, Erdfelder, Lang, & Buchner, 2007). The study is a legitimate one-tailed hypothesis, predicting CBT-D + CBT-I will be better than UC on outcome. Given concerns about Type II error, the usual Type I error rate of .05 was elevated to .1. A sample size of 20 per group (40 total participants) yields a power of .89 in the posttest between group comparisons, indicating sufficient power.

Measures

With the exception of the sociodemographic questionnaire and SLUMS—which were only collected at baseline—all other measures were

collected across study intervals (i.e., baseline, posttreatment, and 3-month follow-up).

Sociodemographic Questionnaire. Information was obtained on age, sex, height, weight, ethnicity, marital status, educational attainment, perceived income adequacy, and employment status. Information on current use of sleep and antidepressant medication was also collected. Height and weight were used to calculate participants' body mass index (BMI), which has demonstrated contributions to both depressive (Luppino et al., 2010) and insomnia symptoms (Jaussent et al., 2011) through various mechanisms. Self-rated health was measured with a single question, "How do you rate your overall health?" with responses ranging from 1 (*poor*) to 6 (*excellent*). Using a single-item to assess self-rated health has been shown to be both valid and reliable (Bowling, 2005; DeSalvo, Bloser, Reynolds, He, & Muntner, 2006). Participants were also administered the Charlson Comorbidity Index, which predicts 1-year mortality for patients who may have a range of comorbid medical conditions (Charlson, Pompei, Ales, & MacKenzie, 1987).

Cognitive status. The SLUMS (Tariq et al., 2006) assessed participants' mental status. Scores on the SLUMS range from 0–30, with lower scores indicating increasing severity of cognitive impairment. The SLUMS was chosen over other cognitive screeners, such as the Mini-Mental State Exam because it has been found to be more sensitive at detecting mild cognitive impairment (Heyn, Tang, Mukaila, Nakamura, & Kuo, 2005). Participants with scores lower than 20 were disqualified due to concerns about probable cognitive impairment.

Depression. The HAM-D (Hamilton, 1960) is a semistructured interview measuring depression severity. A more structured 17-item version of the HAM-D was used in the current investigation (Whisman et al., 1989). Sum scores of 7 or lower indicate no depression, scores of 8 to 16 indicate mild depression, scores of 17 to 23 indicate moderate depression, and scores of 24 or higher indicate severe depression (Zimmerman, Martinez, Young, Chelminski, & Dalrymple, 2013). To remove the effects of sleep, a variable central to this research, the three sleep items were subtracted from the total scores to create a modified HAM-D total score. The HAM-D has adequate overall—if not item-level—convergent, discriminant, and predictive validity (Bagby, Ryder, Schuller, & Marshall, 2004) and is frequently used in depression clinical trials. In our sample, the HAM-D was shown to have acceptable internal consistency ($\alpha = .73$).

Sleep. The ISI consists of seven self-report insomnia items that are each rated on a 0 to 4 scale of severity (Morin, 1993). Sum scores of 7 or lower indicate no clinically significant insomnia, scores of 8 to 14 indicate subclinical, scores of 15 to 21 indicate moderate, and scores of 22 to 28 indicate severe insomnia. Strong reliability (Bastien, Vallières, & Morin, 2001; Savard, Savard, Simard, & Ivers, 2005) and validity (Bastien et al., 2001; Bélanger, Morin, Langlois, & Ladouceur, 2004; Savard et al., 2005) have been established for the ISI. In our sample, the ISI was shown to have acceptable internal consistency ($\alpha = .80$).

The Consensus Sleep Diary (CSD) was used to gather additional self-report sleep data (Carney et al., 2012). The diary provides a record of the time the patient entered bed and the final morning exit (i.e., time in bed [TIB]), sleep onset latency (SOL), number of awakenings (NWAK), wake time after sleep onset (WASO), terminal wake time before the final morning arising (TWAK), and sleep quality rating (SQR) on a scale ranging from 1 (*very poor*) to 5 (*very good*). We modified the core CSD to include naptime (NAP), measured as total number of minutes spent napping or dozing each day. A comment section permitted collecting additional information about illness or substances taken at bedtime that are sleep active (e.g., medications and alcohol). Total sleep time (TST: TIB minus SOL, WASO, and TWAK) and sleep efficiency (SE) percentage ($SE = TST \div TIB \times 100$) are derived from the above variables. These variables and their definitions conform to the recommendations of the Pittsburgh Consensus Conference on evaluating insomnia (Buysse, Ancoli-Israel, Edinger, Lichstein, & Morin, 2006).

Formal assessment of depression and insomnia. A telephone interview immediately after the baseline assessment— and again at posttreatment and follow-up— was conducted to determine if participants satisfied *DSM–IV* criteria for depression and insomnia. We used the Structured Clinical Interview for *DSM–IV–TR* Axis I (SCID I; First, Spitzer, Gibbon, & Williams, 2002) to determine the presence of a depressive disorder. For an insomnia diagnosis, affirmative

responses were required on the following questions: (a) "Do you have difficulty initiating or maintaining sleep?"; (b) "Do you have adequate opportunity for sleep?" (added from the International Classification of Sleep Disorders, II [American Academy of Sleep Medicine, 2005]); (c) "Do you experience significantly impaired daytime functioning associated with poor sleep?"; and (d) "Has your insomnia persisted for more than a month?"

Procedure Overview

Interested patients were given a thorough description of the study via telephone (or in-person if hearing difficulties necessitated) when basic eligibility was confirmed. Those apparently eligible and interested were scheduled for a pretreatment (baseline) assessment that occurred in-person at the participating physician's office. Because some of our participants had low literacy and sensory impairment(s), questionnaires were read to all participants to standardize our assessment procedure. Additionally, to adapt treatments to our target population, we rendered all treatment materials—those tied to both the intervention and UC conditions—to reflect a sixth grade reading level, and administered content quizzes to gauge comprehension.

Informed consent was obtained from eligible participants. Next, participants were randomized into either the integrated CBT condition (CBT-D + CBT-I) or UC, stratified by physician site and race/ethnicity (African American and White). Entry into the integrated CBT condition began as soon as possible after the baseline assessment. A posttreatment assessment was conducted over the phone immediately following treatment (after 10 sessions) for the integrated CBT condition and approximately 10 weeks after completing the baseline assessment for the UC condition. Three months following the posttreatment assessment, a final follow-up assessment was conducted over the phone. Project research assistants, blind to the participants' treatment condition, conducted all assessments. Although the study included several research assistants, one research assistant assessed each participant. However, to ensure accurate assessment delivery, 10% of the audio-recorded assessments that were scored by the project research assistants were randomly selected and retraining occurred until more than 80% exact agreement with the principal investigators (Forrest Scogin and Kenneth Lichstein) on all symptom ratings was achieved. Assessments took 1 to 1.5 hr and were conducted over two occasions if the participant preferred. All participants were compensated $50 for completing the study, and the Institutional Review Board of the University of Alabama approved all study procedures.

Intervention Conditions

Integrated CBT (CBT-D + CBT-I) condition. Integrated CBT treatment was a refined 10-session manualized protocol based on evidence-based treatments for geriatric depression (CBT-D; Thompson, Gallagher-Thompson, & Dick, 1995) and geriatric insomnia (CBT-I; Lichstein & Morin, 2000). Table 1 outlines the session content of the integrated CBT protocol. The CBT-D sequencing decision was based on the structure used by Thompson et al. (1995). The three depression components chosen were as follows: (1) presentation of the cognitive-behavior mediational model, (2) behavioral activation, and (3) identification and disputation of unhelpful thoughts. The sequence of CBT-I components was largely arbitrary, starting with restriction/compression followed by stimulus control and then relaxation. Roughly 25 min of each treatment session was devoted to CBT-D and 25 min to CBT-I. Therapist flexibility in time allocation was necessary based on judgment of participant need.

UC condition. As appropriate, participants assigned to the control condition (and those in the integrated CBT condition) continued to receive physician-recommended primary care services for insomnia/depression. Typically, this would comprise pharmacotherapy for sleep and depression but might also include psychiatric referral.

Therapist training. Research psychotherapists were advanced (3rd year and beyond) graduate students specializing in clinical geropsychology or health psychology in a doctoral program. Their training involved 4 days of didactic and experiential instruction supplemented by general (Scogin, 2000; Zarit & Knight, 1996) and focused reading (Laidlaw, Thompson, Gallagher-Thompson, & Dick-Siskin, 2003; Lichstein & Morin, 2000). Ther-

Table 1
Session Content for the Integrated Cognitive-Behavior Therapy (CBT) Intervention

Session	Sleep component	Depression component
1 and 2	The patient was introduced to the basic rationale that attitudes and behaviors may have disruptive effects on sleep. Treatments are aimed at reducing arousal, decreasing wake time in bed, and moderating sleep beliefs (this last aspect was treated within the depression intervention component). Patients were given a handout summarizing these principles. These sessions also introduced a modified blend of sleep restriction (Wohlgemuth & Edinger, 2000) and sleep compression (Lichstein, Riedel, Wilson, Lester, & Aguillard, 2001) therapy. Patients were given a daily home practice worksheet for sleep restriction (and in later sessions for stimulus control and relaxation) to record enactment of prescribed practice.	The patient was introduced to the basic rationales for this approach; cognition and behaviors influence feelings, specifically in depression (and insomnia) negative views towards the self, the world, and the future are often present. The sessions introduced the importance of behavioral activation and patients were given an activity schedule to complete as homework. An example activity schedule was partially completed to give the participant experience with the form.
3 and 4	The CBT rational for insomnia and the patient's last week experience with sleep restriction was reviewed. The final step of sleep restriction to match prescribed TIB to baseline TST were introduced. An abbreviated stimulus control procedure (Bootzin & Epstein, 2000) was also introduced. Patients were given a handout with two simple rules: (1) Either at the beginning of the night or in the middle of the night, do not go to bed or return to bed unless you feel a strong urge to sleep; (2) once in bed, if you do not fall asleep within about 15 minutes, exit the bedroom.	The CBT rationale for depression and the patient's experience with the activity schedule was reviewed. The relations between activities and mood were highlighted. For example, participants were asked to think about how they feel after they have engaged in an activity versus how they have felt when inactive. Efforts to identify rewarding and pleasurable activities were undertaken with the homework assignment to engage in increased pleasant events. Participants were provided a list of pleasant events often identified by older adults to use as a stimulus for selecting activities to target.
5 and 6	Treatment progress was reviewed. To trouble-shoot barriers tailored modifications were given. These sessions introduced a five minute abbreviated relaxation technique modeled after the passive focusing and relaxing imagery (Lichstein, 2000). The primary components of this procedure are adopting a relaxed attitude, slow deep breathing, and passive body focusing. The patient was encouraged to practice an extended version of this at bedtime and once more during the day. A relaxation tape or CD for home use was provided. Patients were given a handout describing this relaxation procedure.	Progress with behavioral activation was reviewed. Difficulties in activation were addressed. Introduced the unhelpful thought diary, a means of recording the relations between events, thoughts, and feelings. The therapist and patient selected an example from the patient's life to illustrate how to fill in the unhelpful thought diary. The therapist and patient worked to discover thoughts that may be mediating the relations between an event and depressed feeling. In addition to extensive discussion of depressive ideation, examples included the anxiety producing, self-defeating beliefs about sleep that exert sleep disruptive affects as detailed in Bélanger, Savard, and Morin (2006).
7 through 10	Treatment progress and pitfalls were reviewed. A second or third relaxation induction was administered to help cement this skill. Concluded with a summary review of CBT for insomnia.	Unhelpful thought diary was reviewed. The therapist and patient reviewed unhelpful thoughts that the patient observed during their homework exercises. The technique of disputing unhelpful thoughts and gathering disconfirmatory evidence was introduced. Handouts were used as a learning tool. A review of behavior activation and the cognitive meditational model were included in these sessions.

apists were observed by the first author and given feedback until adequate competency was achieved on two mock therapy sessions based on the Cognitive Therapy Scale as evidenced by a total score of 40 or greater (Young & Beck, 1980). Because this study enrolled rural and ethnically diverse participants, research psychotherapists also participated in a half-day cultural sensitivity workshop.

Primary care clinics. The study included five primary care clinics, each of which was located in Alabama's Black Belt or an adjacent county. Each clinic served a predominantly rural area with residents of mostly low socioeconomic status. As such, clinics were comparable regarding the patient population they served, as well as representative of the clinics in rural Alabama.

Telehealth technology. Individual therapy was delivered in real-time audio and visual computer-based communication with participants seated in an office in the primary care clinic and the therapist located at the university. We used Web 2.0 interactive technology tools, especially VoIP (Voice over Internet Protocol). The VoIP tool, Skype, from Skype Technologies, S.A. (www.skype.com), coupled with web cameras and a headset with a boom microphone were the major tool set. Skype was configured for secure voice and videoconferencing therapy sessions. Third party software, Pretty May Call Recorder, was used on the therapist end to capture the audio portion of the session. The audio was recorded as a password protected MP3 file for the therapist and research assistants to evaluate at a later time for delivery fidelity and therapeutic alliance measurement. The therapist initiated the contact and all directions for the participant to become connected to the session were written on a laminated sheet near the computer monitor. Clinic staff at the primary care clinic was available to assist participants encountering complications.

Therapeutic alliance. It was important to establish satisfactory alliance through computer teleconferencing, noting the effect(s) of alliance on treatment outcome (Ahn & Wampold, 2001). Accordingly, we assessed therapeutic alliance using the Working Alliance Inventory–Observer Form (WAI-O; Darchuck et al., 2000; Horvath & Greenberg, 1989). The WAI-O has been used in many studies of psychotherapy (e.g., Arnow et al., 2013; Fenton, Cecero, Nich, Frankforter, & Carroll, 2001). Scores range from 36 to 252, with higher scores indicating better working alliance between the therapist and the patient. Two trained independent raters scored a taped session from early (Sessions 2 through 5) and from late in treatment (Sessions 6 through 9). The WAI-O has been found to have good internal consistency, with an alpha of .98 (Tichenor & Hill, 1989).

Treatment implementation. We monitored delivery and receipt components to ensure treatment was conducted as intended (Lichstein, Riedel, & Grieve, 1994). *Delivery* refers to the proper presentation of the treatment protocol and *receipt* refers to mastery of the treatment rationale and procedures by the patient. Treatment sessions were audiotaped to allow independent raters to assess delivery and receipt. Treatment delivery forms were developed for each session, which assessed whether the therapist administered required assessments, reviewed prior session material, explained the session sleep and depression material, and reminded participants about his or her homework assignment. Delivery ratings ranged from 0% to 100%, with higher ratings indicating greater therapist adherence to the treatment protocol. Receipt was assessed with brief 13-item true/false quiz administered once at 3-month follow-up, which assessed participants understanding of various CBT-D and CBT-I concepts, such as the cognitive-behavior mediational model, sleep hygiene, behavioral activation, and sleep compression. Participants were given one point for each item correctly answered; therefore, scores ranged from 0 to 13, with higher scores indicating greater participant understanding of treatment rationale and procedures.

Data Analyses

We compared the baseline characteristics of the integrated CBT and UC control conditions to establish that randomization was successful. All continuous variables were compared simultaneously with a multivariate analysis of variance (ANOVA), and categorical variables were compared using chi-square.

The primary outcomes were HAM-D (total HAM-D score minus sum of the three sleep items) for depression and ISI for sleep. Additional exploratory analyses on sleep outcomes were conducted focusing on SOL, WASO, SQR, SE, and TST from the sleep diaries. Linear mixed models assessed the effects of integrated CBT and time on outcomes. Specifically, categorical variables group (integrated CBT and UC), time (baseline, posttreatment, and 3-month follow-up) and an interaction term between group and time were fixed effects. Covariates included baseline health status, age, sex, education, race, and income. Participant ID was used as the random effect in the random intercept models to account for the repeated nature of data. Multiple comparisons were adjusted using Bonferroni corrections. We evaluated the levels of outcome in terms of least square means.). The reliable change index was used to measure clinical significance of therapeutic change in the HAM-D and ISI (RCI < -1.96, $p < .05$; Jacobson & Truax, 1991). All analyses were conducted using PROC MIXED procedure in SAS 9.4 (SAS Institute, Cary, NC).

Results

Approximately 63% of the sample completed both the baseline and posttreatment assessments, and 52.5% completed all three assessment periods (see Figure 1). The sample was largely female (90%), with an average age of 58.08 ($SD = 5.62$). Table 2 presents additional demographic characteristics of the sample. Multivariate analysis of variance showed that there was a significant difference, $F(1, 38) = 6.42$, $p = .01$, among SLUMS scores between the integrated CBT (25.28 ± 3.78) and UC (21.83 ± 4.09). To keep the model parsimonious, we made the decision to not include SLUMS scores as a covariate in the following analyses because estimates and p values were not affected by its inclusion. The remaining demographic variables or baseline outcome scores (HAM-D and ISI) were not significantly different between the integrated CBT and UC conditions, suggesting that the randomization was successful. Multivariate analysis of variance and chi-square were used to identify baseline differences between completers (nine integrated CBT and 12 UC) and noncompleters. There were no significant differences in demographic or baseline outcome scores between completers and noncompleters.

Depression Outcomes

The primary depression outcome (total HAM-D scores minus sum of the three sleep items) was not significant for the interaction effect between time and group, $F(2, 39) = 0.61$, $p = .55$ (see Figure 2). There was, however, a significant main effect for time, $F(2, 39) = 6.66$, $p < .01$, with a decrease in mean HAM-D scores after receiving integrated CBT (M difference $= 5.7$, $SE = 1.9$) and UC condition (M difference $= 2.7$, $SE = 2.0$). Approximately 17% of the integrated CBT participants versus none of UC participants experienced clinically significant positive change in the HAM-D at posttreatment. The reliable change in the integrated CBT condition was not significantly different form the UC group, $\chi^2(1, N = 24) = 2.2$, $p = .14$. Of those that had a SCID diagnosis of MDD at baseline ($n = 14$), 40% in the integrated CBT condition and 50% in UC condition no longer met criteria for MDD at posttreatment.

Sleep Outcomes

The primary sleep outcome (ISI scores) was significant for the interaction effect between time and group, $F(2, 41) = 13.47$, $p < .001$ (see Figure 3). Mean ISI scores were significantly different between integrated CBT ($M = 6.7$) and UC ($M = 13.8$) at posttreatment, $F(1, 41) = 9.60$, adjusted $p < .05$, and follow-up (4.7 vs. 16.5), $F(1, 41) = 21.47$, adjusted $p < .05$. The improvement of mean ISI scores at post-treatment for integrated CBT (-11.4) was significantly different from the UC condition (-3.6; $t = -3.37$, $p < .01$). Approximately 75% of the integrated CBT participants versus 18% of UC participants experienced clinically significant positive change in the ISI at posttreatment. The reliable change in the integrated CBT condition was significantly different form the UC group, $\chi^2(1, N = 25) = 9.0$, $p = .003$. Moreover, of those that had an insomnia disorder at baseline ($n = 24$), 87% in the integrated CBT condition and 31% in UC condition no longer met criteria for insomnia at posttreatment.

Exploratory Sleep Outcomes

Exploratory analyses on sleep diary outcomes had mixed findings. The interaction effect between time and treatment was not significant in the prediction of WASO, $F(2, 20) = 1.24$, $p = .31$ or TST, $F(2,$

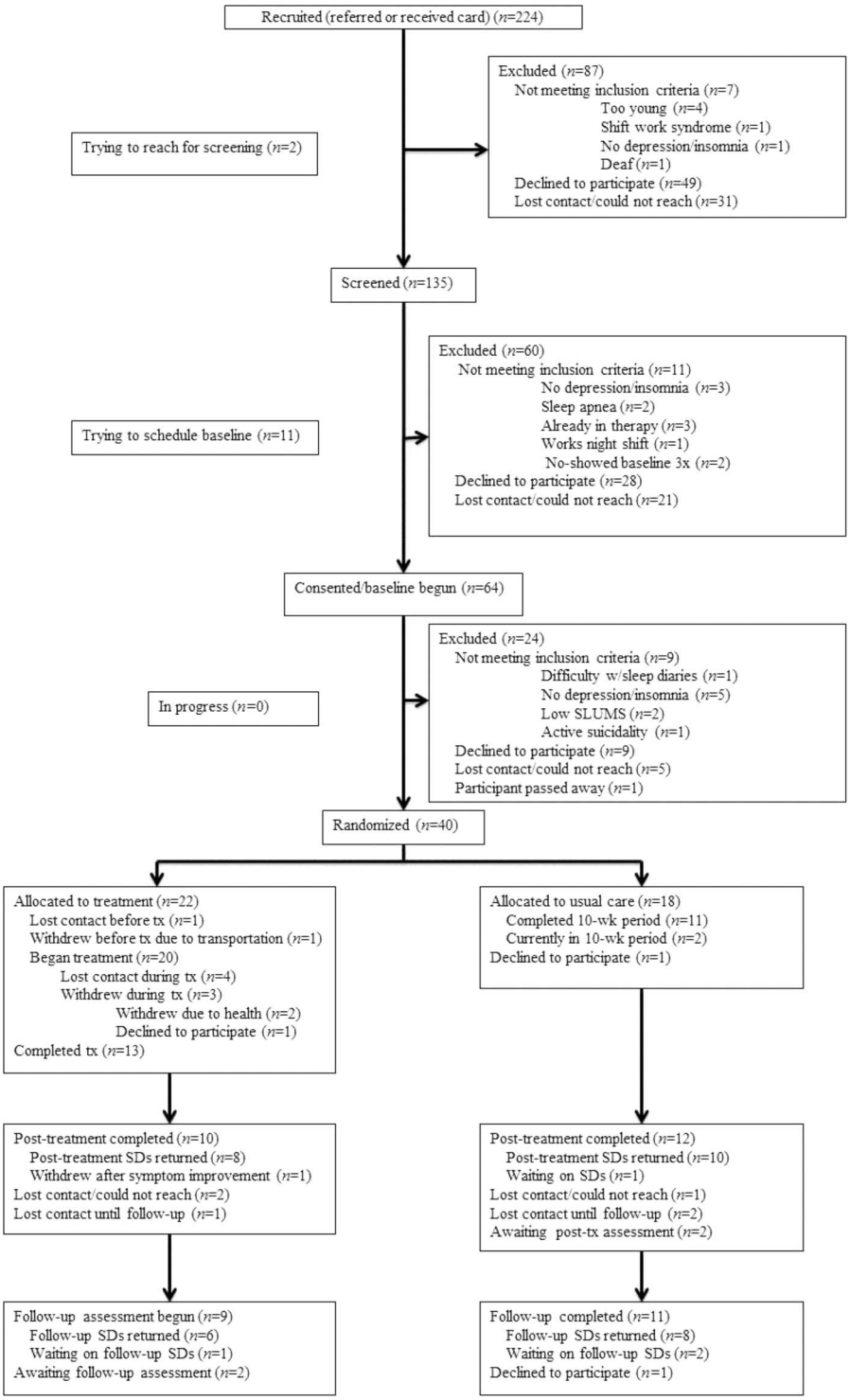

Figure 1. Flow of participants through the course of the study.

Table 2
Baseline Demographic and Clinical Characteristics Stratified by Treatment Condition (N = 40)

	Treatment group $M \pm SD$ or N (%)	Control group $M \pm SD$ or N (%)	p
Total	22	18	
Sex			.06
Female	18 (81.8)	18 (100)	
Male	4 (18.2)	0 (0)	
Age	58.32 ± 6.69	59.78 ± 8.50	.55
Race/ethnicity			.68
White	12 (54.5)	11 (61.1)	
Non-White	10 (45.5)	7 (38.9)	
Years of education	13.45 ± 1.97	12.67 ± 1.91	.21
Marital status			.35
Never married	3 (13.6)	1 (5.6)	
Currently married	6 (27.3)	8 (44.4)	
Partner	3 (13.6)	0 (0)	
Separated	1 (4.5)	3 (16.7)	
Divorced	6 (27.3)	4 (22.2)	
Widowed	3 (13.6)	2 (11.1)	
Perceived income adequacy			.57
Not difficult	2 (9.1)	3 (16.7)	
Not very difficult	3 (13.6)	1 (5.6)	
Somewhat difficult	9 (40.9)	5 (27.8)	
Very difficult	8 (36.4)	9 (50.0)	
Employment status			.85
Retired	5 (22.7)	3 (16.7)	
Part-time	3 (13.6)	1 (5.6)	
Full-time	4 (18.2)	2 (11.1)	
Unemployed	3 (13.6)	4 (22.2)	
Disability	6 (27.3)	7 (38.9)	
Other	1 (4.5)	1 (5.6)	
BMI	31.65 ± 9.85	29.98 ± 6.88	.55
Overall health rating	3.75 ± 1.29	3.69 ± 1.31	.89
Charlson Comorbidity Index	2.50 ± 1.90	3.11 ± 1.64	.29
SLUMS	25.28 ± 3.78	21.83 ± 4.09	.01
Baseline SCID diagnosis			
Major depressive disorder	10 (45.5)	4 (22.2)	.18
Dysthymic disorder	4 (18.2)	3 (16.7)	.68
Baseline insomnia disorder	15 (68.2)	9 (50.0)	.24
Currently taking medication for			
Mood	9 (40.9)	11 (61.1)	.20
Sleep	6 (27.3)	7 (41.2)	.36

Note. BMI = body mass index; SLUMS = Saint Louis University Mental Status Examination; SCID = Structured Clinical Interview for DSM-IV-TR Axis I.

24) = 1.06, $p = .36$. On the other hand, the interaction effect between time and treatment was significant in the prediction of SOL, $F(2, 20) = 4.66$, $p = .02$; SE, $F(2, 19) = 4.69$, $p = .02$; and SQR, $F(2, 27) = 5.93$, $p = .007$. The integrated CBT group (baseline: $M = 90.3$, $SE = 20.8$; posttreatment: $M = 61.2$, $SE = 21.7$) had significantly greater improvements on SOL from baseline to posttreatment as compared to the UC condition (baseline: $M = 82.0$, $SE = 18.1$; posttreatment: $M = 79.8$, $SE = 18.4$), $F(1, 20) = 8.94$, $p < .01$. Additionally, the integrated CBT group (baseline: $M = 65.1$, $SE = 8.4$; posttreatment: $M = 81.2$, $SE = 9.3$) had significantly greater improvements on SE from baseline to posttreatment as compared with the UC condition (baseline: $M = 65.8$, $SE = 7.4$; posttreatment: $M = 68.5$, $SE = 7.7$), $F(1, 19) = 5.3$, $p = .03$. Last, the integrated CBT group (baseline: $M = 2.98$, $SE = .26$; posttreatment: $M = 4.01$, $SE = .32$) had significantly greater improvements on SQR from baseline

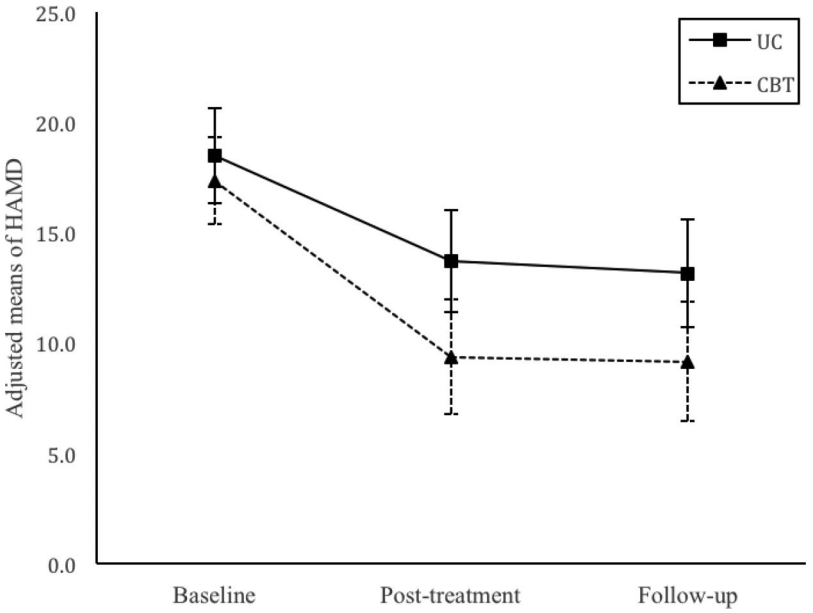

Figure 2. Hamilton Rating Scale for Depression (HAM-D) adjusted mean scores in the integrated cognitive-behavior therapy (CBT) and usual care (UC) conditions at baseline, posttreatment, and 3-month follow-up.

to posttreatment as compared to the UC condition (baseline: $M = 3.19$, $SE = .25$; posttreatment: $M = 3.31$, $SE = .27$), $F(1, 27) = 9.92$, adjusted $p = .004$.

Therapeutic Alliance

Overall and subscale WAI-O scores were comparable to those typically obtained in other clinical trials (LoTempio et al., 2013). The total score for early session alliance was $M = 204.13$ ($SD = 8.05$) and late session alliance was $M = 208.56$ ($SD = 7.28$). For the early session, the mean task, bond, and goal subscale scores were $M = 67.92$ ($SD = 3.24$), $M = 68.33$ ($SD = 2.95$), and $M = 67.88$ ($SD = 2.89$), respectively, and for the late session, scores were $M = 69.06$ ($SD = 3.37$), $M = 69.63$ ($SD = 1.55$), and $M = 69.88$ ($SD = 3.10$), respectively.

Treatment Implementation

Treatment delivery was problematic to assess because therapists were granted authority to tailor treatment to maximize therapeutic effect, while still being scored on adherence to the manual. Therapist delivery scores were generally good with scores ranging from 73.1%–100% ($M = 93.78$). At 3-month follow-up, 15 participants (integrated CBT = 7; UC = 8) completed the 13-item true/false quiz assessing treatment receipt. The mean quiz scores were not significantly different ($t = -.69$, $p = .50$) between the integrated CBT ($M = 11.29$, $SD = 1.70$) and UC ($M = 10.75$, $SD = 1.28$) conditions. That is, both conditions appeared to have adequate knowledge of the integrated CBT procedures regardless of whether they received the intervention. Because we observed minimal variability in the quiz scores, we were unable to evaluate whether participant understanding of various CBT-D and CBT-I concepts was associated with treatment response.

Discussion

The pilot data reported here illustrate the potential utility of using videoconferencing to deliver integrated CBT-D + CBT-I to rural-dwelling, middle-aged and older adults with comorbid symptoms of depression and insomnia. Results indicate that after receiving integrated CBT, mean depression scores decreased; similar results, however, were observed for par-

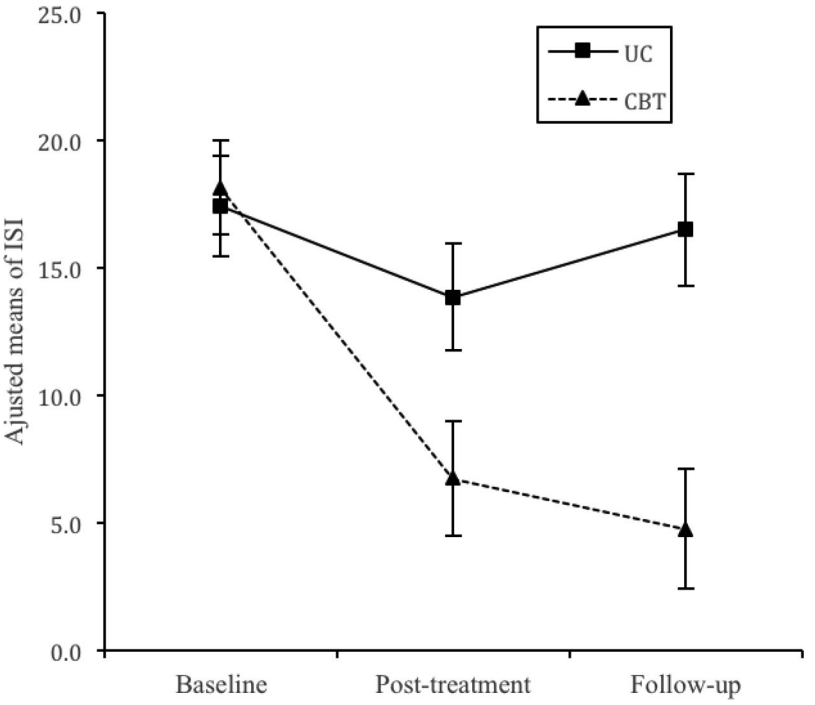

Figure 3. Insomnia Severity Index adjusted mean scores in the integrated cognitive-behavior therapy (CBT) and usual care (UC) conditions at baseline, posttreatment, and 3-month follow-up.

ticipants receiving usual care. Regarding sleep, we observed a significant difference at posttreatment between CBT-D + CBT-I and usual care conditions, with approximately 75% of CBT-D + CBT-I (vs. 18% of UC) participants experiencing clinically significant reductions in insomnia symptoms and a majority (87%) not meeting diagnostic criteria at study's end. The interaction of time and CBT-D + CBT-I treatment significantly predicted other important sleep indices, including SOL, SE, and SQR. These results thus echo previously documented successes of CBT-I as a treatment for insomnia and observations of its posttreatment improvements in comorbid depression (Manber et al., 2008). Analyses also revealed that working alliance for videoconferencing CBT-D + CBT-I was commensurate with that observed in previous, clinical trials of interventions delivered face-to-face.

Unexpectedly, though those participants assigned to treatment made meaningful gains on the HAM-D, so did those in the control group—functionally eliminating the advantage of treatment. We offer several explanations for this curious finding. Participants were not required to have a formal diagnosis of major depressive disorder upon their enrollment. Thus, the nature and number of depressive symptoms our participants endorsed may have been less severe than those reported in prior and similar studies (Manber et al., 2008)—and consequently—may have been more responsive to any clinical attention. Of course, specific causal mechanisms underlying these observed associations remain unclear and potential influences of some other unmeasured third factor must be considered. One intriguing possibility requiring further researching concerns the relative contributions of common and specific process variables in CBT among older adults (Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012), which recent work suggests may enhance patient outcomes beyond the effects of CBT-specific components (Scogin et al., 2018). Another possibility might be that changes in depression are less salient and more

nuanced than those in observed with insomnia; so patients may be underreporting progress upon follow-up relative to the perceived rate of their insomnia improvement. Last, at least 50% of older adults with major depressive disorder fail to adequately respond to first-line treatments (Lenze et al., 2008), making late-life treatment-resistant depression the norm rather than the exception. For patients that do not respond to an initial course of psychotherapy, follow-up treatment strategies include switching treatments (to a different psychotherapy or antidepressant) or augmenting psychotherapy with medication (Thase, Connolly, Roy-Byrne, & Solomon, 2015).

Limitations

Before proceeding, we should note a few limitations of this research. First, although all efforts were made to initiate participants into treatment as soon as possible following screening, time of entrance was variable across participants, possibly influencing outcome. And although our recruitment strategy emphasized enrolling more Blacks than Whites—the current sample does not reflect that goal. Consultation with experienced researchers notwithstanding, study recruitment and retention presented as significant challenges to our process. although our attrition rate for the UC condition (approximately 34%) appears commensurate with those observed in other longitudinal studies using similar samples (Mohr et al., 2005), the attrition rate for the integrated CBT condition was higher than anticipated (approximately 55%). We submit a few possible explanations for this, all of which essentially extend from the consistent finding that attrition appears fundamentally higher in older populations (Gardette, Coley, Toulza, & Andrieu, 2007). For one, our sample was medically frail (i.e., self-reported fair health with multiple health conditions)—so associated complications and resultant cancellations may partially explain this study's attrition rate, as it has in our previous research with a similar population (DiNapoli, Pierpaoli, Shah, Yang, & Scogin, 2017). Anecdotally, some participants also found the expense and time of weekly travel to the clinic burdensome, pointing to the role of convenience in maximizing attrition, particularly with older populations. Although this raises concerns about the generalizability of our findings and feasibility of the treatment, it is heartening that the treatment produced effects even in our small sample.

Another limitation concerns our use of graduate students in CBT-D and CBT-I intervention delivery. Though meta-analyses support the efficacy of psychology graduate-student administered teletherapy (Mohr, Vella, Hart, Heckman, & Simon, 2008), the authors recognize that 4 days of didactic and experiential instruction may undersell the complexity of depression and insomnia treatment. Methodologically, our use of the HAM-D represents another limitation; though options for interview-based depression severity scales are limited and new gold standard has not emerged, leaving this as a common outcome measure in older adult clinical trials. Finally, the reasons for the benefits observed in the UC condition, admittedly, remain unclear because we do not know the proportion of patients using depression or sleep medication at follow up.

Our findings nevertheless enhance understanding of the effectiveness of telehealth CBT treatment models for comorbid geriatric insomnia and depression. Of particular interest here are the overall and subscale WAI-O scores that were comparable to those observed in other clinical trials (LoTempio et al., 2013). Across time—that is during early and late sessions—therapeutic alliance remained strong, suggesting that alliance for videoconferencing may be comparable to that of face-to-face therapy (Lichstein et al., 2013). This has promising clinical implications, particularly for rural-dwelling older adults whose significant socioeconomic, social, and geographic barriers leave psychotherapy services largely unavailable or inaccessible (Gale & Heady, 2013). To further reduce barriers to care, future research should explore delivering integrated CBT with other telehealth modalities, such as through mobile communications devices, such as smartphones and tablet computers, and software applications for these devices.

Conclusion

In sum, these analyses shed new light on the effectiveness of teleconferencing integrated CBT for comorbid geriatric depression and insomnia. Findings suggest that though joint CBT benefits both depression and insomnia symp-

toms, its effects on depression are more equivocal. In particular, the treatment group made more clinically significant gains on the ISI than did the control group—but both treatment and control groups made clinically meaningful gains on the HAM-D posttreatment. Thus, further research should consider expanding the depression treatment component of integrated CBT to enhance effectiveness.

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Efectos de la Terapia Cognitivo-Conductual Integrada, Telesalud Entregada para la Depresión y el Insomnio en Adultos Rurales, Medianos y Mayores

Examinamos los efectos de la terapia cognitiva-conductual integrada para la depresión y el insomnio (CBT-D _ CBT-I, respectivamente) administrados por videoconferencia en adultos de mediana edad y adultos de zonas rurales. Cuarenta pacientes con síntomas depresivos e insomnio fueron aleatorizados para recibir 10 sesiones de CBT-D _ CBT-I o atención habitual (UC). Los pacientes en la condición CBT integrada se dedicaron al tratamiento de telesalud a través de Skype en su clínica de atención primaria. Las evaluaciones se realizaron al inicio, después del tratamiento y a los 3 meses de seguimiento. Los participantes CBT-D _ CBT-I tuvieron mejoras significativamente mayores en el sueño en el post-

tratamiento y en el seguimiento de 3 meses en comparación con los participantes con CU. La interacción Time _ Group para la depresión no fue significativa; los participantes en las condiciones CBT-D _ CBT-I y UC mostraron una disminución en los síntomas depresivos a lo largo del tiempo. Aunque la terapia cognitiva-conductualintegrada beneficia tanto a la depresión como a los síntomas del insomnio, sus efectos sobre la depresión son más equívocos. La investigación adicional debería considerar expandir el componente de tratamiento de la depresión de la terapia cognitiva-conductualintegrada para mejorar la efectividad.

TCC integrada, telesalud, depresión, insomnio, adultos mayores

针对乡村中老年抑郁症和失眠症患者的整合性远程认知行为主义治疗的效果

背景：我们检测了整合性认知行为主义疗法对于抑郁症和失眠（CBT-D ＋ CBT-I）的疗效，通过对在乡村中老年人发送视讯。方法：四十位患有抑郁和失眠症状的病人随机分配到各组， 接受1）10次针对抑郁和失眠的认知行为主义疗法（CBT-D ＋ CBT-I），或者2）普通护理（UC）。被分到整合性认知行为主义疗法情境中的患者们在他们的主治诊所通过Skype参与到远程治疗中。测试评估分别在基准点，疗程后，以及三个月之后的跟进中进行。 实验结果：在抑郁和失眠认知行为主义疗法（CBT-D ＋ CBT-I）小组中的被试同普通护理（UC）组被试相比，在治疗后期和三个月后的跟进中睡眠都有显著性提升。时间_小组的交互作用在抑郁维度上不显著；行为主义疗法小组（CBT-D ＋ CBT-I）和普通护理小组（UC）随着时间推移，都有抑郁症状的减少。结论：尽管综合性认知行为主义疗法对抑郁症和失眠症状都有帮助，此疗法对抑郁症的效果尚未明确。进一步的研究应予考虑扩展整合性认知行为主义疗法的抑郁症治疗的组成，以便提高其有效性。

整合性认知行为主义疗法, 远程医疗, 抑郁症, 失眠症, 老年人群

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