**Acceptance and Commitment Therapy Versus Cognitive Behavioral Therapy for Insomnia: A Randomized-Controlled-Trial**

Date of submission: July 20, 2023

**Abstract**

**Objective:** To compare the effectiveness of an acceptance and commitment therapy (ACT)-based protocol and cognitive behavior therapy (CBT) for insomnia in adults. **Method:** The participants comprised 227 adults with insomnia. They were randomized to six weekly group sessions consisting of ACT-I (*n* = 76), CBT-I (*n* = 76), or waitlist (WL; *n* = 75). **Results:** Both treatment modalities significantly reduced insomnia severity with large effect sizes in the post-treatment phase. These results were maintained during the follow-up period with large effect sizes. CBT was superior to ACT in reducing the Insomnia Severity Index at post-treatment and follow-up, with a small effect size. ACT was superior to WL at post-treatment and at follow-up, with a moderate effect size. The treatment response and remission ratios were higher with CBT at post-treatment and similar at six-month follow-up for both therapies, as ACT made further gains in response and remission. ACT had a significantly higher proportion of response and remission than WL in both periods (post-treatment and follow-up). Both therapies improved daytime functioning at both post-treatment and follow-up, with few differential changes across the groups. **Conclusions:** Both CBT and ACT are effective, with CBT showing superiority and ACT showing delayed improvement. ACT has proven to be an effective therapy, especially in the long term, even in the absence of behavioral techniques such as stimulus control and sleep restriction and is a viable option for those who have difficulties in adhering to behavioral techniques.

*Keywords*: acceptance and commitment therapy, cognitive behavioral therapy, insomnia, sleep

**Public Health Significance Statements**

* This study shows that CBT and ACT are both effective for addressing insomnia.
* The study also shows that ACT is an effective therapy in the long term.

Insomnia disorder can be defined as difficulty falling asleep or maintaining sleep throughout the night; or waking up earlier than desired, given the opportunity and an adequate sleep environment. It must be accompanied by daytime symptoms and not better explained by another disease or medication that can justify the condition. Moreover, symptoms should occur three times per week for at least three months (American Academy of Sleep Medicine, 2014). There is an estimated 10% prevalence of insomnia disorder among adults (Morin et al., 2020), with an estimated 10–20% prevalence in primary care patients (Araujo et al., 2017).

The literature has reported on the adverse effects of insomnia on mental and physical health, being associated with susceptibility to infections, obesity, increased risk of cardiovascular problems and psychiatric disorders such as anxiety and depression (Hertenstein et al., 2019; Grandner et al., 2012). People with insomnia have a 6.7 times greater chance of requiring medical treatment for health reasons (Kryger, 2010). In addition, insomnia is a risk factor for the development and worsening of psychiatric disorders and medical conditions (Perlis et al., 2022).

The economic burden of insomnia is substantial and includes decreased productivity, increased absenteeism, and increased healthcare utilization. Insomnia treatments generate substantial savings in terms of reduced healthcare utilization costs and improve health-related quality of life more cost-effectively (Wickwire et al., 2016).

The recommended first-line treatment for insomnia, whether or not the underlying cause has been identified, is cognitive behavioral therapy for insomnia (CBT-I; Perlis et al., 2022). Meta-analyses have reported the effectiveness of the set of techniques that constitute the CBT-I protocol, with positive changes in different sleep patterns and variables (sleep efficiency, sleep onset latency, awakening after sleep onset, sleep quality, and insomnia symptoms;Boness et al., 2020). The World Sleep Society (WSS) Work Group endorsed the American Academy of Sleep Medicine (AASM) strong recommendation for multicomponent cognitive behavioral therapy (sleep restriction, stimulus control, and cognitive therapy) as the treatment of choice for insomnia disorder (Morin et al., 2023). This recommendation was based on studies in which CBT-I was offered between four and eight sessions to people with and without comorbid conditions. It is noteworthy that CBT-I constitutes an optimal method especially when applied in the individual and in-person format (Morin et al., 2023).

Unfortunately, the individual and in-person format is untenable in many settings (Koffel et al., 2015), especially in low- and middle-income countries where the supply of professionals is more limited. Alternative methods of treatment delivery have been used to make CBT-I more widely available, such as group therapy and online therapy. There are several advantages of group therapy: a) it is cost-effective; b) participants can share their problems with other individuals who suffer from similar complaints; c) a participant can serve as a model for other participants and assist in completing the requested tasks (Verbeek et al., 2006). A meta-analysis study (Koffel et al., 2015) that investigated the effectiveness of CBT-I for insomnia reported positive effects of CBT-I in the group format and pointed to the need for more studies exploring the group format.

Although studies on CBT-I have produced positive results, CBT-I does not lead to remission of the insomnia disorder in 20–25% of patients with insomnia without comorbidities and approximately 60% of patients with insomnia associated with medical comorbidities and psychiatric disorders (Wu et al., 2015). Furthermore, adherence to sleep-restriction techniques is difficult for many individuals (Harvey & Tang, 2003). These aspects highlight the need for new psychotherapeutic approaches to the treatment of insomnia.

Third-wave psychotherapies present a divergent approach to the cognitive strategy used in the multicomponent treatment of CBT-I, presenting itself as a promising new treatment for insomnia, including in patients refractory to CBT-I. Recently, third-wave behavioral therapies such as mindfulness-based therapies and acceptance and commitment therapy (ACT) have demonstrated effective results in the treatment of insomnia (Taylor et al., 2015; Paulos-Guarnieri et al., 2022).

ACT aims to develop and expand behavioral and psychological flexibility, that is, the ability to contact the present moment more fully as a conscious human being, and based on what the situation offers, to change or persist in behavior, in order to serve valued ends (Hayes et al., 1999). ACT relates the processes of acceptance and attention to the processes of commitment and behavioral change (Hayes & Strosahl, 2004). Using ACT, individuals first learn to accept their challenges and then commit to resolving them using behavioral change strategies. ACT can reduce the effort needed to fall asleep by increasing the acceptance of physiological and mental arousal, as well as commitment to the planning of actions based on values (Lundh, 2005). People with insomnia often focus too heavily on their difficulty with sleep, causing them to ignore other aspects of their lives (Espie et al., 2006). Hence, ACT can be an effective strategy for treating insomnia (Hertenstein et al., 2014) by shifting the focus away from sleep complaints and efforts to control it to the acceptance of associated thoughts and feelings. ACT is used for the treatment of insomnia either as monotherapy (ACT-I) or in combination with the behavioral components of stimulus control and sleep restriction (ACT-BBI-I; Paulos-Guarnieri et al., 2022). ACT-BBI-I can aid adherence to sleep restriction and stimulus control techniques (Paulos-Guarnieri et al., 2022).

Studies have reported favorable results from ACT-BBI-I (Chapoutot et al., 2021; El Rafihi-Ferreira et al., 2020, Martin et al., 2023). In a randomized controlled trial, Martin et al. (2023) compared the effectiveness of treatment based on ACT for insomnia versus CBT-I among women veterans and evaluated whether ACT-based treatment resulted in higher treatment completion and adherence versus CBT-I. The outcomes showed that both therapies improved all sleep outcomes from baseline to post-treatment and three-month follow-up. The findings also demonstrated that ACT was superior to CBT-I for some adherence metrics and may improve adherence to some behavioral techniques. Such studies have confirmed the notion that ACT can improve adherence to stimulus control and sleep restriction techniques. However, they do not answer the question whether ACT alone would be effective for insomnia, without requiring the use of sleep restriction and stimulus control techniques.

Considering the difficulty of adhering to stimulus control and sleep restriction techniques (Harvey & Tang, 2003), studies assessing the effectiveness of interventions that do not use these methods are essential. Studies that applied ACT as monotherapy for insomnia are incipient. In a pilot study, El Rafihi-Ferreira, Morin, et al. (2023) compared the effectiveness of protocols for acceptance and commitment therapy for insomnia (ACT-I) and cognitive behavioral therapy for insomnia (CBT-I) in adults. The results demonstrated that both modalities were effective in reducing insomnia symptoms, with CBT-I associated with a higher proportion of insomnia remission post-treatment. The pilot study conducted by Shin et al. (2023) with 30 participants with chronic primary insomnia examined the efficacy of ACT for insomnia compared with CBT-I. The sleep quality and insomnia severity of both groups had significantly improved. However, anxiety was significantly reduced in the ACT group compared with the CBT-I group. The results demonstrated that ACT had a significant effect on primary outcome and secondary outcomes, especially anxiety related to insomnia. Given the small sample size of these studies, additional studies with a larger number of participants are required to generalize the data.

A recent systematic review and meta-analysis (Ruan et al., 2022) suggested that ACT might be an efficacious method for treating insomnia and improving sleep quality. However, the authors of this review point out that the interpretation of the review findings should be evaluated with caution due to the limited number and quality of the studies and point out the need for other randomized clinical trials (RCTs) with a larger sample size and rigorous design to produce more robust evidence to support ACT for insomnia.

Important work has been conducted to investigate the effectiveness of ACT in treating insomnia. However, few studies have compared ACT-based treatment for insomnia with CBT-I (El Rafihi-Ferreira, Morin et al., 2023; El Rafihi-Ferreira et al., 2021; Martin et al., 2023; Shin et al., 2023), especially in ACT-based therapies without stimulus control and sleep restriction. Direct comparison of traditional CBT and ACT for insomnia through randomized clinical trials fills a vital gap in the empirical treatment literature, fulfilling the gold standard method for investigating the relative effectiveness of two treatments for insomnia disorder (Chambless & Hollon, 1998).

Further, it provides an opportunity to compare the efficacy of treatment packages that contain distinct strategies for dealing with maladaptive cognitions (changing the content of thoughts in CBT vs. changing the context by challenging the need to respond rigidly and literally to cognitions in ACT) and uncomfortable internal experiences (to master and reduce insomnia in CBT vs. open toward and accept insomnia in ACT), and that promote different treatment goals (symptom reduction in CBT vs. living a valued life in ACT).

This study aimed to evaluate the effectiveness of group-based ACT for insomnia disorder in adults. The main aim was to examine whether ACT might be another empirically supported treatment option for insomnia. To achieve this aim, group-based ACT was compared with a waitlist control (WLC) group. The study also aimed to compare ACT with CBT-I, an empirically supported gold standard treatment for insomnia disorder. We also investigated the effect of ACT-I on sleep patterns, depression, anxiety, beliefs about sleep, acceptance of sleep, and psychological flexibility. The first hypothesis is that ACT and CBT would be more effective than no treatment at all by comparison with a WLC group. The second hypothesis is that ACT-I would also result in improved sleep patterns, depression, anxiety, beliefs about sleep, acceptance of sleep, and psychological flexibility.

**Methods**

**Study Design and Ethics**

This was a prospective, randomized, three-arm, parallel-group, controlled clinical trial comparing ACT vs. CBT vs. WL for chronic insomnia in adults. Outcomes were assessed post-treatment (one week after completion of treatment) and at the six-month follow-up. This study was approved by the research ethics committee of the university where it was conducted [CAAE: 65743917.2.0000.0068/ Approval number: 4.582.587]. All the participants provided informed consent electronically. This study’s design was preregistered at ClinicalTrials.gov (Identifier: NCT04866914); see [https://classic.clinicaltrials.gov/ct2/show/study/NCT04866914].

**Recruitment, Screening, Participants, and Randomization**

Adults suffering from insomnia complaints were recruited from advertisements on social media of Institute of Psychiatry at University of São Paulo, between March 2021 and July 2022. The study assessments and interventions were conducted online. The self-administered survey was managed using REDCap (Research Electronic Data Capture), a secure web platform for building and managing databases and online surveys. Clinical interviews and therapy groups were conducted using the platform Zoom.

Interested individuals accessed the REDCap database platform and responded to an initial screening that involved completing sociodemographic information and insomnia complaints. The following inclusion criteria were employed: (a) 18 to 59 years old and (b) meeting criteria for chronic insomnia: (i) difficulty initiating or maintaining sleep, defined as a sleep onset latency and/or wake after sleep onset greater than or equal to 30 minutes, and/or waking up earlier than desired with a corresponding sleep time of less than or equal to 6.5 hours per night; (ii) presence of insomnia for more than three nights per week and more than three months; and (iii) sleep disturbance (or associated daytime fatigue) causing significant distress or impairment in social, occupational, or other areas of functioning. This definition represents a combination of criteria from the American Academy of Sleep Medicine, International Classification of Sleep Disorders, and Diagnostic and Statistical Manual of Mental Disorders, along with quantitative cutoffs typically used in insomnia research (American Academy of Sleep Medicine, 2014; American Psychiatric Association, 2013; Edinger et al., 2004).

To confirm eligibility, participants underwent medical and neuropsychiatric evaluations by an experienced clinician. The neuropsychiatric evaluation was based on the Mini International Neuropsychiatric Interview (MINI; Amorim, 2000). The following exclusion criteria were used: (a) presence of a progressive or unstable physical illness (e.g., cancer, acute pain) or neurological degenerative disease (e.g., dementia); (b) unstable psychiatric comorbidities, such as a lifetime diagnosis of a psychotic or bipolar disorder or more than two lifetime episodes of major depressive disorder or an untreated current major depressive disorder; (c) evidence of sleep apnea (moderate or severe risk for apnea based on Berlin Questionnaire), restless legs or periodic limb movements during sleep (obtained by subjective perception of restless sleep) or a circadian-based sleep disorder (e.g., delayed or advanced sleep phase syndrome); (d) a current alcohol or substance misuse problem; (e) marijuana abuse (use more than once a week); (f) illiteracy; (g) working night shifts and being unable to discontinue this work pattern during the trial; (h) unavailability for attending the group sessions; and (i) do not have a computer with internet to carry out the sessions via Zoom. Participants were not excluded for the use of sleep medication (including over-the-counter); however, to avoid confounding between behavioral treatment and medication effects, only participants taking stabilized sleep medications for at least three months were accepted. These participants were instructed not to change their medication or increase their dose during the research period.

Participants who met the inclusion criteria were randomized to the ACT-I, CBT-I or waitlist (WL) group. To ensure that the groups were well distributed in terms of insomnia severity, randomization was stratified by the Insomnia Severity Index (ISI, mild and moderate insomnia with a score between 8 and 21 vs severe insomnia with a score between 22 and 28). The allocation list of participants was generated using online REDCap randomization software. The randomization procedure was performed by a person independent of the study to ensure that randomization was blinded to the therapists.

After randomization, participants received an e-mail asking them to complete the instruments for the initial phase (pre-treatment) via the REDCap platform. Participants received no compensation for their participation in the study.

**Treatments**

Treatments were provided in the context of six weekly group therapy sessions lasting 90 to 120 minutes with groups consisting of five to seven participants that took place on Zoom.

The common therapeutic elements in both ACT and CBT protocols were psychoeducation on sleep and sleep hygiene. The ACT-I protocol was based on Hayes et al.’s (2012) ACT manual and El Rafihi-Ferreira, Morin, et al.’s (2023) protocol. The intervention focus was on the therapeutic processes of acceptance, cognitive defusion, contact with the present moment, self as context, values, and committed actions. The CBT-I protocol was based on the protocols of Harvey et al. (2014) and El Rafihi-Ferreira, Morin, et al. (2023), and the intervention focused on the behavioral components of sleep restriction, stimulus control, and cognitive restructuring of maladaptive beliefs regarding sleep and the daytime effects of insomnia. Table 1 presents the contents of each session for the two groups.

[Insert Table 1 here]

***Therapists***

The study therapies were administered by clinical psychologists and psychiatrists certified in sleep science. These professionals received protocol training (ACT and CBT) from professionals experienced in behavioral-analytic and cognitive-behavioral approaches.

***Waitlist***

For participants in the waitlist group, a session was held in which the researcher presented the sleep diary application and answered questions regarding its completion. In this session, participants were informed about the functions of the waitlist group and the periods during which they completed the questionnaires and diaries.

During the waiting period, participants in the control group recorded information about their sleep patterns using a sleep diary application. All participants completed measures pre-treatment, post-treatment, and at six-month follow-up. For ethical reasons, after re-evaluation at the six-month follow-up, the control group participants were provided with the intervention (CBT-I or ACT-I).

The measurement instruments are described below.

**Measures**

**Participants’ data:** Sociodemographic and clinical information, including sex, age, ethnicity, marital status, family composition (having children), occupation, education level, insomnia duration, type of insomnia, use and type of medication, and comorbidities (clinical and psychiatric). This information was obtained during the initial interviews.

***Insomnia Severity Index (ISI):*** The ISI was developed by Morin (1993) and validated in Portuguese by Castro (2011). The ISI is a retrospective seven-item scale that evaluates the nature, intensity, and impact of insomnia during the last month; the tool measures difficulties in starting or maintaining sleep, early morning awakening, degree of sleep satisfaction, daytime impairment, perception of sleep problems by others, and degree of sleep problem concern. All items are assessed using a five-point Likert scale (0 = *no severity* to 4 = *high severity*), resulting in a total score ranging from 0 to 28. Scores are classified as follows: absence of insomnia (0–7), mild insomnia (8–14), moderate insomnia (15–21), or severe insomnia (22–28).

**Sleep Diary:** Participants completed daily sleep diaries during a two-week baseline period, the six-week treatment phase, and for two weeks at the post-treatment and six-month follow-up assessments. The primary dependent variables derived from the diaries were sleep onset latency (SOL), wake after sleep onset (WASO), total sleep time (TST), time in bed, and sleep efficiency (SE). A sleep diary was recorded using the Condorinst.com application.

***Hospital Anxiety and Depression Scale (HADS):*** The HADS comprises 14 items with two subscales for assessing anxiety and depression. All items refer exclusively to the emotional state and do not reflect somatic symptoms. The total score for each subscale is 0–21. Scores of 0–8 indicate the absence of anxiety/depression, and scores of 9 and above indicate the presence of anxiety/depression (Zigmond & Snaith, 1983). The Brazilian version was translated into and validated by Botega et al. (1995), with Cronbach’s alpha values of 0.68 and 0.77 for anxiety and depression, respectively.

***Acceptance Action Questionnaire-II (AAQ-II):*** The AAQ-II is a retrospective self-report questionnaire developed by Bond et al. (2011) to assess psychological inflexibility. The tool measures experience avoidance and efforts to avoid contact with unpleasant private events, such as thoughts, feelings, emotions, and sensations, or to change their occurrence, form, or frequency, especially when they lead to undesirable results. The items are rated on a Likert scale (1 = *not true* to 7 = *always true*); high scores indicate higher psychological inflexibility. Example items are as follows: “I worry about not being able to control my worries and feelings.” The Brazilian version of the tool was translated and validated by Barbosa and Murta (2015) and demonstrated satisfactory reliability and suitability for use in the study.

***Dysfunctional Beliefs and Attitudes About Sleep Scale (Morin et al., 2007):*** The Dysfunctional Beliefs and Attitudes About Sleep Scale (DBAS-16) measures sleep-disruptive cognitions, such as beliefs, attitudes, expectations, evaluations, and attributions. Its 16 items are derived from the original 30-item scale and rated on an 11-point scale ranging from 0 (strongly disagree) to 10 (strongly agree). Similar to the original version, the DBAS-16 has a four-factor structure: (a) consequences of insomnia, (b) worry about sleep, (c) sleep expectations, and (d) medication. Example of item as follow: “When I sleep poorly on one night, I know it will disturb my sleep schedule for the whole week”. We used the Brazilian-Portuguese version translated and validated by Carmo et al. (2023), which showed adequate psychometric properties.

***Sleep Problem Acceptance Questionnaire*** (Bothelius et al., 2015): The Sleep Problem Acceptance Questionnaire (SPAQ) is a self-assessment tool designed to evaluate individual acceptance of sleep issues. As a relatively new measure, it comprises eight items that assess two factors—activity engagement and willingness. Activity engagement pertains to the extent of an individual’s persistence in carrying out routine activities despite dissatisfaction with sleep quality. Conversely, willingness captures an individual’s ability to give up the struggle to control and overcome sleep problems. Each item is rated on a seven-point Likert scale, with 0 indicating “disagree” and 6 signifying “completely agree.” The total score ranges from 0 to 48, with willingness items scores being reversed. A higher score implies a lower acceptance of sleep problems. The SPAQ can provide insights into how the acceptance of sleep problems may affect treatment outcomes and overall quality of life. The SPAQ includes items such as “Although things have changed, I am living a normal life despite my sleeping problems”.  The Brazilian-Portuguese version of the SPAQ used in this study was adapted from English by Carmo and Rafihi-Ferreira (2023).

***Sleep Acceptance Scale (SAS)*** (El Rafihi-Ferreira, Carmo, et al., 2023): The Sleep Acceptance Scale (SAS) is a brief self-assessment tool for adults that measures their acceptance of sleep problems. It comprises six items rated on a scale ranging from 1 (never) to 7 (always), with higher scores indicating lower acceptance of sleep problems. The questionnaire is divided into two dimensions: avoidance (two items) and distress (four items). One of the SAS items is follow: “I am scared of not being able to fall asleep”. The two-factor model showed good fit indices and internal consistency of 𝜔 = 0.55 for Avoidance and 𝜔 = 0.93 for Distress.

***Adherence and satisfaction questionnaire:*** Developed by the researchers for this study, the questionnaire was composed of eight closed questions (yes or no) referring to the adherence and satisfaction of participants regarding the intervention program. Items were as follows: 1. Did you find it easy to understand the treatment? 2. After each session, were you committed to carrying out the tasks? 3. The day before each session, did you want to go? 4. Did you follow the recommendations and tasks requested in the intervention program? (For this question, the answer options were no, partially, and completely.) 5. Did you want to give up treatment? 6. Are you satisfied with the results of the treatment? 7. Would you recommend this treatment to other people? 8. What is your feeling about the treatment? (For this question, the answer options were negative, neutral, or positive). This questionnaire was administered after participants completed the intervention in the post-treatment phase.

**Outcomes**

The primary outcome measure for this study was based on change in ISI total score at the post-treatment and follow-up phases after adjusting for the baseline score. Secondary outcomes were treatment response (change or reduction in the ISI total score of 8 points or more), insomnia remission (a final ISI score under 8 points), sleep patterns (SOL, WASO, TST, SE) measured using a sleep diary and the HADS, AAQ-II, SPAQ, SAS, and DBAS-16 scores at the post-treatment and follow-up phases, adjusting for baseline. Adherence and satisfaction with treatment information were collected via the adherence and satisfaction questionnaire at post-treatment.

**Statistical Analysis**

All reported analyses were performed on an intention-to-treat population. Given the flexibility of mixed-effects models to deal with missing data, we did not use any imputation methods. We used R version 4.3.0 (R Core Team, 2023) for all our analyses. We examined the primary and secondary outcomes of the self-report scales at post-treatment and follow-up using mixed-effects models, choosing the Gaussian family with an identity link function using the R package *lmerTest* version 3.1-3 (Kuznetsova et al., 2017). The self-report scales were z-standardized to assist with model estimation. We used a random intercept for the participants and fixed effects for the group variables. Treatment effects were assessed using the fixed effects of group variables (ACT vs. CBT-I and ACT vs. waitlist) and their interaction with time (pre-test *vs*. post-test and pretest *vs*. six-month follow-up). We also estimated pairwise contrasts to examine changes across time within groups. Sleep diary variables were analyzed using generalized mixed models (GMM) with the package *glmmTMB* version 1.1.7 (Brooks et al., 2017) with Gaussian (*total sleep time*), gamma (*time in bed*), zero-inflated gamma (WASO and SOL), and beta (*sleep efficiency* and *sleep satisfaction*) distributions. The fixed effects were group, time, group-by-time interaction, and baseline scores. We selected the most appropriate distribution by generating density plots of raw scores and verifying homoscedasticity, normality of residuals, and influential cases using the *DHARMa* package version 0.4.6 (Hartig, 2022).

To measure treatment success, we used binary variables to show whether the participant achieved a response (ISIpost − ISIpre ≥ 8), remission at post-treatment (ISI < 8), and remission maintenance at six-month follow-up (ISI < 8). These variables were used as outcomes of logistic regression models, where we included the fixed effects of group (ACT vs. CBT-I and ACT vs. waitlist) as predictors. Additionally, we analyzed the six questions related to treatment adherence and satisfaction using logistic regression models, with group (ACT vs. CBT-I) as a predictor.

**Power and Sample Size**

Based on estimates of a pilot study (El Rafihi-Ferreira, Morin, et al., 2023), the Hotteling Lawley Trace test was used to calculate the total sample size required to detect mean differences in ISI scores, considering a 5% level of significance and 80% power. The test indicated a total sample size of 144 participants with three evaluations. The sample size for each group was increased until 50 to account for dropouts. It is worth noting that, initially, the expected sample size was 150, as recorded in clinical trials. Based on this estimate, calls were accepted from those interested in participating in the study up to one month after the recruitment announcements began, which led to an increase in the sample size; therefore, we had a total of 227 participants.

All data have been made publicly available at the [Acceptance and Commitment Therapy Versus Cognitive Behavioral Therapy for Insomnia: A Randomized-Controlled-Trial] and can be accessed at [https://osf.io/zs98u/?view\_only=90551aca6811439f8b153b3a85073544]. The code behind this analysis/simulation has been made publicly available at the [Acceptance and Commitment Therapy Versus Cognitive Behavioral Therapy for Insomnia: A Randomized-Controlled-Trial] and can be accessed at [https://osf.io/zs98u/?view\_only=90551aca6811439f8b153b3a85073544].

**Results**

**Flow of Participants**

In total, 625 participants were assessed for eligibility. A total of 398 individuals were excluded prior to randomization due to the following reasons: not responding to the researchers’ contact via telephone or email or declining to participate in study (n=195); unstable psychiatric comorbidities (unstable/severe symptoms, bipolar disorder identified from the MINI) (n=77); other untreated sleep disorders (sleep apnea, restless legs, circadian-based sleep disorder) (n=38); not meeting diagnostic criteria for insomnia disorder (n=34); not having time availability to participate in the weekly sessions (n=54). A total of 227 adults with chronic insomnia were randomly assigned to one of three groups: (a) ACT-I; *n* = 76, (b) CBT-I; *n* = 76, or (c) WL; *n* = 75. Figure 1 summarizes the flow of the study.

[Insert Figure 1 here]

***Baseline Clinical and Sociodemographic Characteristics of the Participants***

There were no significant differences between ACT, CBT-I, and WL in any primary or secondary outcome measures at baseline. The demographic and clinical characteristics of the three groups were similar (Table 2).

[Insert Table 2 here]

***Changes in Primary Outcome, Treatment Response, and Insomnia Remission***

Table 3 presents the GMM results for the primary outcome, treatment response, and insomnia remission. Both treatment modalities significantly reduced insomnia severity with large effect sizes in the post-treatment phase. These results were maintained during the follow-up period with large effect sizes. CBT was superior to ACT in reducing the ISI at post-treatment and follow-up, with a small effect size. ACT was superior to WL at post-treatment and at follow-up, with a moderate effect size. The treatment response and remission ratio were higher with CBT at post-treatment and similar at six-month follow-up for both therapies, as ACT made further gains in response and remission. ACT had a significantly higher proportion of response and remission than WL in both periods (post-treatment and follow-up). WL reduced the ISI score in the post- and follow-up phases; however, the difference was not as large as that in the therapeutic groups. Figure 2 presents the mean variations in the ISI at all evaluation and protocol phases.

[Insert Table 3 here]

[Insert Figure 2 here]

***Changes in Sleep Patterns***

After treatment, CBT was superior to ACT in terms of SOL, *B*=0.57 [95% CI: 0.3 to 0.84], WASO, *B*=0.6 [95% CI: 0.2 to 1.01] and SE, *B*=-0.52 [95% CI: -.78 to -.27]; however, these measures were similar between the groups at the six-month follow-up. In contrast, ACT was superior to WL in terms of SE in post-treatment, *B*=0.34 [95% CI:.11 to .56], follow-up, *B*=0.47 [95% CI:.22 to .72], and sleep satisfaction in post-treatment, *B*= 0.69 [95% CI: 0.33 to 1.05] and follow-up, *B*=1.11 [95% CI: 0.72 to 1.51].

***Changes in Secondary Outcomes***

For both treatment modalities, significant improvements were observed in depression, psychological flexibility, acceptance, and beliefs about sleep (*p* < .001). Both therapies were superior to WL in these variables. The reduction in beliefs about sleep in post-treatment, *B*=.49 [95% CI:.22 to .75] and follow-up, *B=*.57 [95% CI:.31 to .84] and psychological inflexibility in follow-up, *B*=.31[95% CI:.06, .55] were greater in CBT than in ACT, see Supplementary Materials.

***Adherence and Satisfaction to Treatment***

Most participants in both groups reported understanding the therapeutic proposal (89% ACT vs 80% CBT, p= .23), engaging in the requested tasks (95% ACT vs 98% CBT, p= .66), showing motivation for therapy (95% ACT vs 88% CBT, p= .26), and not thinking about giving up treatment (92% ACT vs 87% CBT, p= .48). Furthermore, most participants reported satisfaction with the results (92% ACT vs 88% CBT, p= .65) and a positive feeling toward the treatment (95% ACT vs 92% CBT, p= .63). Almost all the participants would recommend the treatment to others (100% ACT vs 92% CBT, p= .06). Comparison between groups demonstrated that, compared to the ACT-I group, a significantly higher proportion of participants in the CBT-I group reported completely following the recommendations provided in the intervention program (38% vs 57%, p= .04); see Supplementary Materials.

**Discussion**

This study aimed to compare the efficacy of CBT and ACT for insomnia and assess their effects on sleep patterns, anxiety and depression symptoms, psychological flexibility, acceptance, and beliefs about sleep. CBT is an empirically supported treatment for insomnia (Boness et al., 2020). Our results add to the substantial existing evidence that CBT is an effective treatment for insomnia, even when performed in a group or in an online format. An additional contribution of this study is that ACT used singly, that is, without stimulus control and sleep restriction techniques, is also effective for insomnia. This is the first study to document such results in a three-arm RCT comparing ACT with the gold-standard insomnia treatment (CBT) and no treatment (WL). The main finding of this study was that both treatment groups improved significantly, with large effect sizes for the primary outcome, insomnia severity. The results were maintained at follow-up with large effect sizes. Although WL reduced ISI scores, the effect size was significantly larger in the treatment groups. Both treatments were superior to the waitlist condition. A comparison between therapies showed that CBT-I showed better results than ACT-I in reducing ISI scores, but with small effect sizes, indicating that the size of the difference is not substantial.

These results confirm our first hypothesis by demonstrating that both therapies are more effective than the absence of treatment. Indeed, the effectiveness of CBT is already well documented, including in group and online formats (Boness et al., 2020; van Straten et al., 2018). This study also provides evidence of the effectiveness of therapeutic groups conducted over the internet. Review and meta-analysis studies have reported the benefits of ACT for insomnia but highlight the need for more studies, including RCT with larger samples and comparison groups, to assess the effectiveness of ACT for insomnia (Paulos-Guarnieri et al., 2022; Ruan et al., 2022). Therefore, this study fills an important gap in the scientific literature by documenting the effectiveness of ACT based on a robust methodology.

Four studies have compared ACT with CBT for insomnia. In two studies (El Rafihi-Ferreira et al. 2021; Martin et al., 2023), ACT was applied together with stimulus control and sleep restriction and the results did not show any differences between the therapeutic modalities. In other two studies (El Rafihi-Ferreira, Morin, et al., 2023; Shin et al., 2023), ACT was applied as monotherapy, and the results were similar to those of CBT. The present study contrasts the results of previous studies by demonstrating the superiority of CBT over ACT, despite the size of the difference being relatively small. However, unlike previous studies, which were conducted with smaller samples and in a face-to-face group format, this study is the first to use an online group format. This study corroborates other studies (Chapoutot et al., 2021; Lappalanainen et al., 2019) that showed positive results for ACT in an online format. These findings are important because online therapy overcomes geographical barriers, reduces costs, and increases accessibility.

In ISI categorical results, at post-treatment, there were higher rates of response to CBT (53%) than to ACT (37%). Likewise, response to the ACT rate was significantly higher than that of WL. The remission rate for CBT (32%) was higher than that for ACT (19%), and that for ACT was higher than that for WL (1%). While the initial treatment response was more modest for ACT participants, the outcome for ACT improved significantly at six-month follow-up, as evidenced by the high rates of both treatment response (48%) and insomnia remission (27%). CBT still had high rates of treatment response (52%) and insomnia remission (35%). However, at the six-month follow-up, ACT and CBT were similar, with no significant differences between the groups. Both treatments were superior to WL in terms of response and remission. Therefore, CBT produced faster improvements, whereas ACT produced slower and more sustained improvements.

This finding is consistent with that of a previous study (El Rafihi-Ferreira, Morin, et al., 2023) that demonstrated an increase in response and remission rates six months after the end of ACT-I. By contrast, the remission rates for both CBT and ACT were lower than those reported by El Rafihi-Ferreira, Morin, et al. (2023). This difference may be related to the online format. Therapies in the face-to-face format are known to be more effective than those in the online format (van Straten et al., 2018); however, despite being online, the therapies were applied face-to-face, that is, with interaction in real time. Another hypothesis was that the therapies were conducted during the COVID-19 pandemic, which may have directly influenced the participants’ differentiated routines during this period. In addition, studies report the worsening of mental disorders and psychological suffering during the pandemic and post-COVID, especially in developing countries such as Brazil. (Damiano et al., 2022; Suen et al., 2022).

The focus of CBT-I, and in particular the behavioral components, is on nocturnal symptoms. Intervention directed exclusively at nocturnal symptoms, such as sleep restriction and stimulus control, explains the superior results of CBT-I in improving post-treatment SOL, WASO, and SE patterns. However, at the six-month follow-up, SE and WASO measurements were similar between the treatments. ACT focuses beyond sleep and does not exclusively focus on insomnia symptoms. Our hypothesis for the subsequent improvement in ACT is that, in this approach, behavioral change occurs through the processes of acceptance, defusion, present moment, values, and actions with commitments. We believe that such processes require time to change; thus, it is possible that the change in the relationship that individuals have with their sleep benefits sleep quality. However, with our results, we cannot determine which therapy mechanisms are directly or indirectly involved in improving sleep. To explore these aspects, studies are needed to investigate the mediating and moderating mechanisms between therapies (ACT and CBT) and sleep improvement.

This different trajectory of change is perhaps expected, given that CBT directly targets behavioral and sleep-scheduling factors with the best effectiveness, such as stimulus control and sleep restriction. Furthermore, cognitive therapy postulates that it is necessary to change thoughts and feelings to change behaviors (Collard, 2019; Hayes, 2008). Thus, focusing directly on sleep and the content of one’s beliefs could lead to faster responses in the short term.

In contrast, with ACT, focusing beyond sleep symptoms, working on change, and the persistence of behaviors that go toward one’s values may be a slower and sustained process. ACT targets psychological processes (e.g., acceptance, defusion, attention to the present memento, self-as-context, values, and committed action), which may take longer to modify; however, once modified, the changes are sustained without further therapist guidance. Therefore, the improvements observed in sleep and insomnia, especially during the six-month follow-up corroborates the focus of ACT, which aims at flexibility, planning actions based on values, and cultivating sustainable and long-term goals. As contextual therapy, the function of behavior and thought is privileged, as is how individuals relate to their private events (Collard, 2019; Hayes, 2008). ACT is composed of six processes that comprise the hexaflex. In our study, we used a combination of processes but did not compare processes separately. We also did not use instruments that identified each process, since the AAQ-II used to assess psychological inflexibility was a unidirectional instrument. Thus, we could not determine which of the processes or their combinations were responsible for the improvement of insomnia.

The superiority of ACT over WL in terms of sleep efficiency and sleep satisfaction supports the hypothesis that changing the relationship with sleep benefits sleep. The similarity between the therapies at the six-month follow-up and the superiority of ACT over WL demonstrates the feasibility of using ACT for patients with difficulties in following recommendations aimed exclusively at sleep, such as stimulus control and sleep-restriction techniques.

Regardless of the therapeutic modality, we cannot disregard the possible effects of common factors and the group therapy format. Previous research (Koffel et al., 2015; Verbeek et al., 2006) has reported some benefits of group therapy for insomnia, such as social support at a time when participants were asked to make behavioral changes, identification, and helpful components of treatment. This study did not explore the effect of common factors and the format of the intervention, making it impossible to draw any conclusions in this regard. Therefore, future studies should explore these aspects.

Our second hypothesis, that ACT would improve depression, anxiety, beliefs about sleep, acceptance of sleep, and psychological flexibility, was partially confirmed as ACT-I resulted in improved depression, acceptance, and beliefs about sleep, showing superiority to WL. Both therapies improved these parameters. These findings suggest that the benefits of therapy reflect a transdiagnostic effect. Furthermore, we believe that improved sleep can positively influence psychological well-being, regardless of the therapeutic approach. However, CBT was superior to ACT in improving sleep beliefs and demonstrated improvement in psychological inflexibility.

Regarding beliefs, our result is expected, since one of the focuses of CBT is to modify dysfunctional beliefs about sleep. Interestingly, ACT showed small changes in the AAQ-II. Similar results were observed in a study by Lappalainen et al. (2019), who reported improvement in insomnia, depression, and beliefs about sleep, but also showed no changes in psychological flexibility. Lappalanein et al. (2019) suggested that the AAQ-II does not reveal the essential processes related to insomnia. Furthermore, the AAQ-II is a unidimensional instrument, which makes it impossible to identify which of the six inflexibility/flexibility processes is associated with insomnia (Paulos-Guarnieri et al., 2022). Walgost (2014) proposed that the AAQ-II measures more psychological distress than psychological inflexibility. If we consider this aspect, CBT improvement in this variable may be more closely related to the reduction in psychological distress than flexibility.

Considering the possible flaws in the AAQ-II, we believe that other instruments that assess the six processes of psychological inflexibility (e.g., the Multidimensional Psychological Flexibility Inventory and the comprehensive assessment of acceptance and commitment therapy; Francis et al., 2016; Rolffs et al., 2016) can provide a more accurate measure of psychological inflexibility (Ong et al., 2018) and identify which dimensions of psychological inflexibility are more associated with improvement in insomnia (Paulos-Guarnieri et al., 2022).

Our study did not investigate the mediating and moderating mechanisms between therapies and the reduction of secondary outcomes (i.e., anxiety, depression, acceptance, beliefs about sleep, and psychological inflexibility). Therefore, we could not determine whether improvement in sleep led to an improvement in psychological variables, whether there was a transdiagnostic effect of the therapy or whether other uninvestigated factors led to these results (i.e., common factors related to the characteristics of therapists, participants, etc.). We do not exclude the hypothesis that improved sleep may lead to improvements in other variables. This could explain the reduction in psychological inflexibility that was greater in CBT participants at the six-month follow-up. Future studies should explore such mechanisms, including those of common therapy factors.

Satisfaction with the intervention was observed in both groups. It is noteworthy that all ACT participants recommended the intervention. Regarding adherence, little more than 50% of the participants reported completely adhering to the CBT-I protocol tasks, while less than 50% of the participants reported completely adhering to the ACT-I tasks. Strategy adherence was higher in the CBT group, which may explain the superiority of post-treatment findings. As noted by Morin et al. (2023), treatment adherence is an important issue when assessing treatment efficacy for any treatment for insomnia, since low adherence may reduce the impact of treatment. Although many participants adhere to treatment, the non-adherence rate is still high, requiring more studies focusing on adherence. In fact, the literature has reported the difficulty of adhering to some components of CBT-I (Harvey & Tang, 2003), one of the reasons for testing new protocols without using behavioral techniques such as sleep restriction. However, our findings demonstrated that the CBT-I protocol that included techniques such as sleep restriction and stimulus control had greater adherence than a protocol without these techniques, as was the case with ACT-I. In terms of behavioral tasks, the CBT-I protocol guidelines involve direct and objective instructions about sleep window and stimulus control, while the ACT-I protocol guidelines involve carrying out mindfulness practices. Future studies should explore which factors can predict adherence to behavioral treatment and whether these are different between theoretical approaches and recommendations established in treatments.

An important aspect to be considered is that our study presents a topographical analysis of the results, measuring the response to the treatment using scales (e.g., ISI, sleep diary, HADS, and DBAS) that focus on the topography of the behavior and not on its function. Future studies should prioritize function over topography, which carries out ideographic analyses and evaluations with various measures over time, using a range of methods and instruments to evaluate core processes and treatment outcomes. To this end, other designs, such as single-subject designs with time-series analyses, should be encouraged. In this way, it is possible to move toward process-based therapy.

The strengths of our study include the use of validated outcome measures, a good uptake rate, a good satisfaction rate, inclusion of participants with insomnia with and without psychiatric comorbidities, treatment with or without hypnotic medication, and reflecting the real-life experience of adults with insomnia.

Our study has some limitations that warrant care in the interpretation of our findings. First, sleep variables were assessed only through self-report. Thus, our reliance on participant-reported variables may have been vulnerable to reporting bias. Future studies should use objective measures of sleep, such as actigraphy. This methodology, together with self-report instruments, would be useful to aid evaluations and provide greater detail of the sleep characteristics in this population. Second, we did not include individuals with unstable psychiatric comorbidities, adults with substance dependence, or elderly people; therefore, the outcomes cannot be generalized to all adults with insomnia. Third, the six sessions of ACT were shorter than those of ACT for other disorders. For example, ACT for generalized anxiety disorder and psychotic symptoms consists of up to 16 sessions (Öst, 2014; Roemer et al., 2008; Shawyer et al., 2012) and ACT for depression and social anxiety consists of up to 12 sessions (Kocovski et al., 2013; Öst, 2014; Zettle & Hayes, 1986; Zettle & Rains, 1989). We cannot exclude the possibility that an adequate initial dose of ACT requires more than six sessions. Future studies should evaluate longer treatment protocols with a greater number of sessions and compare their effectiveness in different formats, such as online, individual, group, and self-help. Fourth, most of our sample consisted of white women with high levels of education, which does not represent the characteristics of most of the Brazilian population. Future studies with more representative samples, including those with lower educational levels, should be conducted.

Finally, several additional domains for future research arise from the present study including a need to 1) investigate the variables that are related to success and failure, as well as adherence and non-adherence to behavioral treatment for insomnia; 2) assess whether there are differences in variables related to success and failure, adherence and non-adherence between CBT-I and ACT-I; 3) identify the benefits of each therapeutic element (e.g., dismantling trials); 4) use multidimensional measures (e.g., MPFI, CompACT) or instruments of specific processes (e.g., CAQ-8, CFQ, SACS, VQ) to identify the hexaflex processes associated the insomnia; 5) evaluate the treatment in different populations (e.g., different age groups, comorbidities), and 6) use different methodologies to identify the main processes (e.g., single subject design).

**Conclusions**

Our results show that both CBT-I and ACT-I are effective, with the superiority of CBT and delayed improvement of ACT. ACT-I has proven to be an effective therapy, especially in the long term, even in the absence of behavioral techniques such as stimulus control and sleep restriction, and is a viable option for those who have difficulties in adhering to behavioral techniques.

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**Tables**

**Table 1**

*Weekly Schedule for ACT-I and CBT-I Groups*

|  |  |  |
| --- | --- | --- |
|  | Therapeutic elements | |
| Session | ACT-I | CBT-I |
| 1 | Introduction of therapist and group members  Information about secrecy, absences, Zoom online platform and sleep diary app  Psychoeducation on sleep  Brief explanation of the ACT | Introduction of therapist and group members  Information about secrecy, absences, Zoom online platform and sleep diary app  Psychoeducation on sleep  Brief explanation of the CBT |
| 2 | Sleep hygiene  Contact with the present moment  Mindfulness exercises | Sleep hygiene  Stimulus control therapy  Sleep restriction therapy |
| 3 | Creative hopelessness  Acceptance  Cognitive defusion  Mindfulness exercises | Review of home practices and problems using all behavioral techniques (sleep hygiene, stimulus control, and sleep restriction)  Set new sleep window for upcoming week  Cognitive restructuring of the maladaptive beliefs regarding sleep and daytime effects of insomnia |
| 4 | Creative hopelessness  Acceptance  Self as context  Acceptance and mindfulness exercises | Review of home practices and problems using all behavioral techniques  Set new sleep window for upcoming week  Cognitive restructuring of the maladaptive beliefs regarding sleep and daytime effects of insomnia |
| 5 | Values and committed action  Mindfulness exercises | Review of home practices and problems using all behavioral techniques  Set new sleep window for upcoming week  Cognitive restructuring of the maladaptive beliefs regarding sleep and daytime effects of insomnia |
| 6 | Values and committed action | Adjust sleep window for upcoming weeks.  Cognitive restructuring of the maladaptive beliefs regarding sleep and daytime effects of insomnia  Maintaining treatment gains and relapse prevention |

*Note.* ACT-I = acceptance and commitment therapy for insomnia; CBT-I = cognitive behavioral therapy for insomnia.

**Table 2**

*Participant Characteristics at Baseline*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ACT (*n* = 76) | | | | CBT (*n* = 76) | | | | WL (*n* = 75) | | | | Total (*n* = 227) | | | |  |
| Variable | % | *n* | *M* | *SD* | % | *n* | *M* | *SD* | % | *n* | *M* | *SD* | % | *n* | *M* | *SD* | *p* |
| ***Demographics and diseases characteristics*** | | | | | | | | | | | | | | | | | |
| Gender (female) | 78 | 59 |  |  | 74 | 56 |  |  | 77 | 58 |  |  | 76 | 173 |  |  | .817 |
| Age (years) |  |  | 40.5 | 10.6 |  |  | 40.3 | 9.7 |  |  | 40.8 | 10.3 |  |  | 40.6 | 10.2 | .959 |
| Ethnicity |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | .117 |
| Asian | 3 | 2 |  |  | 4 | 3 |  |  | 4 | 3 |  |  | 3 | 8 |  |  |  |
| Black | 16 | 12 |  |  | 28 | 21 |  |  | 23 | 17 |  |  | 22 | 50 |  |  |  |
| White | 82 | 62 |  |  | 64 | 49 |  |  | 73 | 55 |  |  | 73 | 166 |  |  |  |
| Not informed | 0 | 0 |  |  | 4 | 3 |  |  | 0 | 0 |  |  | 1 | 3 |  |  |  |
| Marital Status |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | .807 |
| Cohabiting | 13 | 10 |  |  | 13 | 10 |  |  | 16 | 12 |  |  | 14 | 32 |  |  |  |
| Divorced | 5 | 4 |  |  | 8 | 6 |  |  | 11 | 8 |  |  | 8 | 18 |  |  |  |
| Married | 43 | 33 |  |  | 37 | 28 |  |  | 37 | 28 |  |  | 39 | 89 |  |  |  |
| Single | 35 | 27 |  |  | 41 | 31 |  |  | 36 | 27 |  |  | 37 | 85 |  |  |  |
| Widowed | 3 | 2 |  |  | 1 | 1 |  |  | 0 | 0 |  |  | 1 | 3 |  |  |  |
| Has children | 38 | 29 |  |  | 55 | 42 |  |  | 43 | 32 |  |  | 45 | 103 |  |  | .090 |
| Ocupation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | .936 |
| Informal work | 3 | 2 |  |  | 5 | 4 |  |  | 5 | 4 |  |  | 4 | 10 |  |  |  |
| Regular work | 42 | 32 |  |  | 38 | 29 |  |  | 40 | 30 |  |  | 40 | 91 |  |  |  |
| Retired | 3 | 2 |  |  | 1 | 1 |  |  | 5 | 4 |  |  | 3 | 7 |  |  |  |
| Self-employed | 30 | 23 |  |  | 30 | 23 |  |  | 32 | 24 |  |  | 31 | 70 |  |  |  |
| Student | 12 | 9 |  |  | 14 | 11 |  |  | 9 | 7 |  |  | 12 | 27 |  |  |  |
| Unemployed | 10 | 8 |  |  | 10 | 8 |  |  | 8 | 6 |  |  | 10 | 22 |  |  |  |
| University degree | 82.9 | 63 |  |  | 77.6 | 59 |  |  | 82.7 | 62 |  |  | 81.1 | 184 |  |  | .646 |
| Insomnia duration (years) |  |  | 8.89 | 8.64 |  |  | 10.13 | 9.95 |  |  | 8.56 | 8.01 |  |  | 9.20 | 8.89 | .557 |
| Type of Insomnia |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | .655 |
| Initial | 5.3 | 4 |  |  | 5.3 | 4 |  |  | 4.0 | 3 |  |  | 4.8 | 11 |  |  |  |
| Middle | 2.6 | 2 |  |  | 2.6 | 2 |  |  | 0.0 | 0 |  |  | 1.8 | 4 |  |  |  |
| Late | 0.0 | 0 |  |  | 2.6 | 2 |  |  | 0.0 | 0 |  |  | .9 | 2 |  |  |  |
| Mixed | 88.2 | 67 |  |  | 84.2 | 64 |  |  | 93.3 | 70 |  |  | 88.5 | 201 |  |  |  |
| Nonrestorative | 1.3 | 1 |  |  | 1.3 | 1 |  |  | 0.0 | 0 |  |  | .9 | 2 |  |  |  |
| Other | 2.6 | 2 |  |  | 3.9 | 3 |  |  | 2.7 | 2 |  |  | 3.1 | 7 |  |  |  |
| Use of medication | 60.5 | 46 |  |  | 50.0 | 38 |  |  | 56.0 | 42 |  |  | 55.5 | 126 |  |  |  |
| Type of medication |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | .795 |
| Benzodiazepine | 6.6 | 5 |  |  | 6.6 | 5 |  |  | 8.0 | 6 |  |  | 7.0 | 16 |  |  |  |
| Z-drugs | 14.5 | 11 |  |  | 11.8 | 9 |  |  | 20.0 | 15 |  |  | 15.4 | 35 |  |  |  |
| Antidepressant | 9.2 | 7 |  |  | 9.2 | 7 |  |  | 10.7 | 8 |  |  | 9.7 | 22 |  |  |  |
| Melatonin | 6.6 | 5 |  |  | 3.9 | 3 |  |  | 4.0 | 3 |  |  | 4.8 | 11 |  |  |  |
| Mixed | 7.9 | 6 |  |  | 9.2 | 7 |  |  | 2.7 | 2 |  |  | 6.6 | 15 |  |  |  |
| Over-the-counter | 15.8 | 12 |  |  | 9.2 | 7 |  |  | 10.7 | 8 |  |  | 11.9 | 27 |  |  |  |
| Comorbidity |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | .381 |
| Medical (any) | 10.5 | 8 |  |  | 14.5 | 11 |  |  | 10.7 | 8 |  |  | 11.9 | 27 |  |  |  |
| Psychiatric (other) | 2.6 | 2 |  |  | 7.9 | 6 |  |  | 8.0 | 6 |  |  | 6.2 | 14 |  |  |  |
| Anxiety | 28.9 | 22 |  |  | 31.6 | 24 |  |  | 21.3 | 16 |  |  | 27.3 | 62 |  |  |  |
| Depression | 28.9 | 22 |  |  | 21.1 | 16 |  |  | 37.3 | 28 |  |  | 29.1 | 66 |  |  |  |

*Note*. ACT-I = acceptance and commitment therapy for insomnia; CBT-I = cognitive behavioral therapy for insomnia; WL = waitlist

**Table 3**

*Means and Changes Scores on the Primary Outcome (Insomnia Severity Index) According to Group and Time*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Means (SDs), by time and change scores** | | | | **Comparisons between groups** | | | | |
| Time or change | ACT (*n* = 76) | CBT (*n* = 76) | WL (*n* = 75) |  | Beta [95% CI] | *p*-value | d |  |
| t1 (pre) | 19.14 (4.21) | 19.05 (3.95) | 19.71 (4.1) | ACT vs. CBT× t2-t1 | .33 [.09, .58] | .008 | .26 | ACT < CBT |
| t2 (post) | 11.27 (5.21) | 9.00 (5.05) | 16.26 (4.66) | ACT vs. CBT × t3-t1 | .27 [.02, .52] | .035 | .21 | ACT < CBT |
| t3 (FU6) | 10.83 (5.63) | 8.84 (4.78) | 16.28 (5.32) |  |  |  |  |  |
| Change t1-t2 (d) | 7.91 (1.43)\*\*\* | 10.02 (1.74)\*\*\* | 3.53 (.67)\*\*\* | ACT vs. WL × t2-t1 | -.69 [-.93, -.46] | <.001 | -.57 | ACT > WL |
| Change t1-t3 (d) | 8.30 (1.49)\*\*\* | 10.00 (1.70)\*\*\* | 3.55 (.66)\*\*\* | ACT vs. WL × t3-t1 | -.75 [-.99, -.51] | <.001 | -.61 | ACT > WL |
| Change t2-t3 (d) | .39 (.07) | -.03 (-.005) | .03 (.005) |  |  |  |  |  |
| **ISI Response N(%) (reduction of at least 8 points from baseline)** | | | | | | | | |
| t2 (post) | 28 (37) | 40 (53) | 18 (24) | ACT vs. CBT - t2 | 2.59 [1.27, 5.37] | .010 |  | ACT < CBT |
| t3 (FU6) | 36 (48) | 39 (52) | 12 (16) | ACT vs. CBT - t3 | 1.60 [0.77, 3.37] | .214 |  | ACT = CBT |
| Change t2-t3 | 4 (5) | 2 (3) | 4 (5) |  |  |  |  |  |
|  |  |  |  | ACT vs. WL – t2 | 2.21 [1.08, 4.62] | .032 |  | ACT > WL |
|  |  |  |  | ACT vs. WL – t3 | 6.11 [2.83, 13.96] | < .001 |  | ACT > WL |
| **ISI Remission N(%) (ISI<8)** | | | | | | | | |
| t2 (post) | 14 (19) | 24 (32) | 1 (1) | ACT vs. CBT - t2 | 2.41 [1.11, 5.37] | .028 |  | ACT < CBT |
| t3 (FU6) | 20 (27) | 26 (35) | 3 (4) | ACT vs. CBT - t3 | 1.79 [0.86, 3.78] | .124 |  | ACT = CBT |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  | ACT vs. WL – t2 | 19.1 [3.67, 351.86] | .005 |  | ACT > WL |
|  |  |  |  | ACT vs. WL – t3 | 10.0 [3.19, 44.26] | < .001 |  | ACT > WL |

*Note*. ISI = Insomnia Severity Index; ACT = acceptance and commitment therapy; CBT = cognitive behavior therapy; WL = waitlist; FU6 = follow-up six month; SD = standard deviation; CI = confidence interval; d = effect size; Cohen’s d. \*\**p* < .01. \*\*\**p* < .001

**Figures**

**Figure 1**

*Flow Diagram of Participants in Each Stage of the Study*

Uma imagem contendo Tabela

Descrição gerada automaticamente

**Figure 2**

*ISI Scores in the Groups and Protocol Phases*

Gráfico, Gráfico de linhas

Descrição gerada automaticamente