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## Effects of a Multi-Component Behavioral Intervention (MCI) for Insomnia on Depressive and Insomnia Symptoms in Individuals with High and Low Depression

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### Abstract

Insomnia and depression are prevalent and co-occurring conditions that are associated with significant impairment of life. Previous research indicates that cognitive-behavioral interventions for insomnia (CBT-I) can improve both insomnia and depressive symptoms. The aim of this study was to determine whether a multi-component behavioral intervention (MCI) improved both insomnia and depressive symptoms in persons presenting with insomnia and high levels of depression. The sample consisted of 321 individuals with insomnia who participated in a trial of insomnia treatments; 106 participants had high levels of depression (score ≥ 16 on CES-D) at baseline. Participants either received the MCI or a control treatment (sleep education and hygiene booklet). At post-test, participants with high and low levels of depressive symptoms showed significant improvement in insomnia symptoms. Those with high depression also had significant reductions in depressive symptoms. It can be concluded that for individuals with depression and insomnia, CBT-I is a viable intervention for managing depressive symptoms, which complements other approaches for treating depression.

### Keywords

cognitive-behavioral; depression; insomnia; mental health; social work

## Introduction

Depression and insomnia are prevalent mental health issues that have untoward consequences. Depression is associated with many chronic conditions such as heart disease, stroke, and diabetes (Penninx, Milaneschi, Lamers, & Vogelzangs, 2013). It often causes significant impairment of life, and individuals can experience psychosocial consequences such as declines in job status, income, and interpersonal relationships (Coryell et al., 1993). Insomnia is associated with many health conditions including cardiovascular disease, chronic pain, Parkinson's disease, and psychiatric disorders (Thase, 2005). It has significant consequences as well, including impaired functioning, distress, and a lower quality of life.

Depression and insomnia frequently co-occur. In the past insomnia has been conceptualized as a symptom of depression (Riemann, Berger, Voderholzer, 2001), but recent evidence indicates that insomnia and depression have a complex, bidirectional relationship (Franzen & Buysse, 2008). Insomnia independently aggravates depression, and vice versa (Taylor, Lichstein, Weinstock, Sanford, & Temple, 2007). Therefore, when insomnia and depressive symptoms co-exist, it is important for insomnia to be directly addressed as well as depression (Jindal & Thase, 2004). Cognitive-behavioral treatments for insomnia (CBT-I) are evidence-based interventions that have been found to improve not only insomnia symptoms but also depressive symptoms in studies that included small samples (Germain et al., 2006; Taylor, Lichstein, Weinstock, Sanford, & Temple, 2007; Manber et al., 2008; Manber et al., 2011).

It is important to further investigate the impact of CBT-I on the severity of insomnia and depressive symptoms in larger samples in order to promote the applicability of this treatment to persons of diverse demographic and clinical backgrounds. If the interventions for insomnia are consistently found to improve both depressive and insomnia symptoms, then these interventions may become viable treatment strategies for managing either of these symptoms in clinical practice. Physicians, nurses, and social workers, who often have the training and resources to provide various therapeutic interventions, can provide the behavioral treatments to manage both insomnia and depression, thereby contributing to patients' health.

## Depression and Insomnia

The lifetime prevalence of a major depressive episode is 13% in the United States and 12% in Canada, making it one of the most common psychiatric disorders (Kessler et al., 1994; Patten et al., 2006). Many more individuals experience a wide spectrum of depressive symptoms that may not meet the diagnostic criteria for major depression, but nevertheless have a significant effect on their quality of life. These symptoms include low mood, diminished interest or pleasure, agitation, feelings of worthlessness or guilt, and insomnia (American Psychiatric Association, 2000).

Insomnia is generally defined as difficulty initiating or maintaining sleep (American Academy of Sleep Medicine, 2001). Other symptoms include early morning awakenings and non-restorative sleep. Up to 30% of individuals in the United States (Roth, 2007) and 40% of Canadians (Morin et al., 2011) report at least one symptom of insomnia.

Insomnia has a strong relationship with depression; it is present in up to 90% of depressed individuals (Ohayon, Caulet, & Lemoine, 1998). Historically, insomnia has been understood as a symptom of depression (Riemann, Berger, Voderholzer, 2001). Indeed, depression affects sleep quality and quantity (Gupta, Dhiya, & Bhatia, 2009) and can lead to the development of insomnia (Jansson & Linton, 2006; Buysse et al., 2008). On the other hand, insomnia is a risk factor and early sign of depression. Johnson (2006) found that in most (69%) persons with comorbid insomnia and depression, insomnia occurred first. Perlis et al. (2006) observed that elderly people with persistent insomnia were six times more likely to develop their first major depressive episode compared to individuals with no insomnia. A meta-analysis found that non-depressed people with insomnia had a twofold risk to develop depression (Baglioni et al., 2011). A longitudinal study found that between 17% and 50% of individuals with more than two weeks of insomnia develop major depressive episodes or a major depressive disorder (Buysse et al., 2008).

The above evidence suggests a complex bidirectional relationship between insomnia and depression, making it difficult to determine cause and effect (Franzen & Buysse, 2008). Some researchers hypothesize that the high comorbidity and bidirectional nature of the two conditions may be associated with a shared underlying biological (Staner, 2010) or cognitive-behavioral mechanism. The relationship between insomnia and depression demands effective management to minimize their joint consequences on individual wellbeing.

### Interventions for Insomnia

Currently there are two treatment modalities for the management of insomnia: pharmacotherapy and cognitive-behavioral therapy. Pharmacotherapy for insomnia often involves the prescription of hypnotic agents, benzodiazepines, or sedating anti-depressants (Schutte-Rodin, Broch, Buysse, Dorsey, & Sateia, 2008). For individuals with comorbid insomnia and depression, physicians have a number of options for pharmacotherapy; they can prescribe an anti-depressant with sedating side-effects, a combination of two different anti-depressants, an anti-depressant combined with a benzodiazepines, GABA-A receptor agonists, or over-the-counter sleep aids such as antihistamines and melatonin (Jindal & Thase, 2004). Patient education and follow-up is crucial in pharmacotherapy. Patients using medication for insomnia on a long-term basis need to be monitored to ensure the drug is effective and safe (i.e. does not cause severe side effects) over time (Freedom, 2011).

Cognitive-behavioral interventions for insomnia (CBT-I) involve a combination of behavioral strategies such as stimulus control therapy and sleep restriction therapy, and cognitive therapy such as cognitive reframing (Bootzin & Epstein, 2011). CBT-I has been well established as being effective for treating insomnia in several meta-analyses (Morin, Bootzin, Buysse, Edinger, Espie, & Lichstein, 2006; Smith et al., 2002; Irwin, Cole, & Nicassio, 2006), even when compared to pharmacotherapy. Smith et al. (2002) conducted a meta-analysis of 21 studies from 1966 to 2000 examining the short-term efficacy of behavioral treatments for insomnia compared to pharmacotherapy. Behavioral therapy was equally effective for improving sleep outcomes related to number of awakenings, wake time after sleep onset, total sleep time, and sleep quality, but was more effective than

pharmacotherapy for improving sleep onset latency problems. In a randomized control trial comparing CBT-I and pharmacotherapy singly and in combination for 63 individuals with chronic sleep-onset insomnia, CBT-I produced larger improvements in sleep onset latency and sleep efficiency than medication; these improvements were maintained at 12-month follow up. Combining pharmacotherapy with CBT-I had no therapeutic advantage over CBT-I alone, and medication alone only produced moderate improvements that were not maintained after medication use was discontinued (Jacobs, Pace-Schott, Stickgold, & Otto, 2004).

Although empirical evidence suggests CBT-I is more effective in improving and managing insomnia compared to medications, a limitation of the studies is that persons with psychiatric conditions such as depression were excluded (Smith et al., 2002; Jacobs, Pace-Scott, Stickgold, & Otto, 2004). Therefore, this evidence does not indicate if CBT-I is effective for persons with both insomnia and other psychiatric comorbidities such as depression.

### **Treating Comorbid Insomnia and Depression**

The traditional view of comorbid depression and insomnia has been that depression is the primary disorder and psychiatric interventions should focus on eliminating depression with the hope that insomnia symptoms will also abate (Buysse et al., 1997). However, many patients with comorbid depression and insomnia who have otherwise responded well to depression treatment (either CBT or medication) have reported residual sleep problems (Carney, Segal, Edinger, & Krystal, 2007). Insomnia and depression have a reciprocal relationship in which each disorder exacerbates the other (Taylor, Lichstein, Weinstock, Sanford, & Temple, 2007). In this way, the continued presence of insomnia in persons who have recovered from depression makes it more likely for them to relapse back into depression (Jindal, 2009). Therefore, it is in the interest of persons with comorbid depression and insomnia to manage the insomnia as part of their treatment plan, rather than focusing on the depression alone (Jindal & Thase, 2004).

CBT-I has been found effective in improving sleep in individuals with insomnia who have comorbid conditions such as depression. A randomized controlled trial examining the efficacy of CBT-I compared to sleep hygiene, which was considered a control condition, in 81 adults with mixed psychiatric disorders (primarily depression and PTSD) found that CBT-I improved sleep quality and other insomnia symptoms (Edinger et al., 2009). Another study of 44 older adults with primary depression and 'secondary insomnia' examined a behavioral treatment for insomnia (a combination of relaxation and stimulus control therapy). The behavioral intervention significantly improved sleep and this improvement was sustained over time (Lichstein, Wilson, & Johnson, 2000). In addition, a study examining 37 individuals with depression and insomnia who had not responded to pharmacological treatment for depression observed that the addition of a brief behavioral treatment for insomnia produced a significant reduction in insomnia compared to treatment as usual which involved a meeting with physician and medication (Watanabe et al., 2011). The above evidence, although based on studies with small samples, suggests that behavioral

therapies for insomnia can be effective in managing insomnia for individuals with various psychiatric comorbidities such as depression.

Evidence also suggests that some behavioral treatments have the potential to improve both sleep and depression in individuals with comorbid insomnia and depressive symptoms. Morawetz (2003) observed that in 86 individuals with comorbid depression and insomnia, treating the insomnia with a six-week self-help behavioral intervention (a combination of sleep scheduling, stimulus control instructions, cognitive therapy, and relaxation techniques) and no medication for either depression or insomnia, led to a significant improvement in depressive symptoms in individuals whose sleep improved. Germain et al. (2006) found that a brief 45-minute behavioral treatment for insomnia (a combination of sleep education, stimulus control instructions, and sleep restriction therapy) produced significant improvements in both sleep measures and daytime symptoms of depression and anxiety in 35 older adults with insomnia and other comorbid conditions (including depression). A pilot study of 10 individuals with insomnia and mild depression found that six sessions of CBT-I (a combination of sleep hygiene, stimulus control instructions, and progressive muscle relaxation) effectively ameliorated insomnia and depressive symptoms (Taylor, Lichstein, Weinstock, Sanford, & Temple, 2007). Another study evaluated the effectiveness of adding seven individual sessions of CBT-I (a combination of sleep education, sleep restriction, stimulus control instructions, stress management, and cognitive restructuring) to anti-depressant medication for 30 individuals with comorbid insomnia and depression, compared to the anti-depressant alone. The group given CBT-I had a significantly higher remission from both insomnia and depression compared to the persons given only medication for depression (Manber et al., 2008). Finally, a study that examined the efficacy of CBT-I (seven group sessions that included sleep education, stimulus control instructions, sleep restriction therapy, relaxation training, scheduled worry time, and relapse prevention) in 301 individuals with high and low depressive symptom severity found that individuals with high levels of depressive symptomology had similar improvements in insomnia symptoms compared to the low depressive group and also experienced a significant reduction in depressive symptom severity (Manber et al., 2011).

The above evidence is promising in terms of what behavioral treatments for insomnia may offer individuals with comorbid depressive and insomnia symptoms. However, three of the above studies had small sample sizes ranging from 10 (Taylor, Lichstein, Weinstock, Sanford & Temple, 2007) to 30 (Manber et al, 2008) and 35 (Germain et al., 2006). Furthermore, Germain et al. (2006) examined older adults over the age of 65 and did not specifically examine depression, as participants had anxiety and other stable psychiatric conditions. Finally, Morawetz (2003) focused on examining the depressive symptoms only in individuals whose sleep had improved substantially as a result of the CBT-I intervention, rather than in all individuals who underwent the intervention.

The present study addressed this gap in knowledge; it involved a larger sample size ( $n=321$ ) of persons with a wide age range and aimed to more comprehensively evaluate the effectiveness of a multi-component behavioral intervention (MCI) in persons with insomnia who concurrently had low and high levels of depressive symptoms. The study hypothesis was that participants with insomnia and high levels of depressive symptoms receiving the

MCI for insomnia would experience an improvement in both insomnia and depressive symptoms. This hypothesis is supported by recent findings indicating a reduction in both insomnia and depressive symptoms following the implementation of a behavioral intervention for insomnia (Germain et al., 2006; Taylor, Lichstein, Weinstock, Sanford, & Temple, 2007; Manber et al., 2011). Replicating these findings with a larger sample size and a wider range of ages is important in order to determine whether behavioral treatments for insomnia are effective for individuals with a high level of depressive symptoms and further, whether the treatment concurrently reduces the level of depressive symptoms in individuals with high depression at baseline.

## Methods

### Research Design

The data were obtained from a large trial of behavioral treatments for insomnia (Sidani, Epstein, Bootzin, Moritz & Sechrest, 2007). Participants (n = 321) were allocated to either the multi-component intervention (MCI) or control treatment, and completed pretest and posttest measures of depression and insomnia. The MCI involved sleep education and hygiene, stimulus control therapy, and sleep restriction therapy. The control treatment consisted of a booklet presenting information on sleep education and hygiene.

### Sample

The sample consisted of persons with insomnia. They met the following eligibility criteria: 1) community-dwelling, non-institutionalized adults of at least 21 years of age, 2) ability to read and write English, and 3) complaint of insomnia of at least 3-month duration, as indicated by sleep onset latency and/or time awake after sleep onset of 30 minutes or more per night, for a minimum of 3 nights per week, as ascertained by a daily sleep diary maintained for 14 days at baseline. Persons were ineligible if they had a diagnosis of sleep apnea (self-reported), cognitive impairment evidenced by a score < 27 on the Mini-Mental State Exam (MMSE; Folstein, Folstein & McHugh, 1975), or psychological impairment indicated by a Global Severity Index T score > 50 on the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983).

The participants were divided into two sub-groups based on their levels of depression assessed at pretest. The first sub-group included those with a high level of depressive symptoms and the second sub-group included those with a low level of depressive symptoms.

### Treatment

The MCI involved three components. The first consisted of discussing sleep hygiene recommendations such as blocking out noise, avoiding caffeine before bedtime, and avoiding napping. The second was stimulus control therapy; it involves informing and supporting individuals in making changes in their bedroom and in their bedtime activities such as going to bed only when sleepy, not engaging in any activity in bed, and getting out of bed if they can't fall asleep within 15-20 minutes (Bootzin, Smith, Franzen, & Shapiro, 2010). The third component was sleep restriction therapy, which focuses on reducing time



spent in bed to the actual sleep time that individuals report and developing a consistent sleep-wake schedule in order to consolidate sleep and increase sleep efficiency (Spielman, Yang, & Glovinsky, 2011).

## Measures

The Insomnia Severity Index (ISI) was used to measure perception of insomnia severity. The ISI consists of seven items that inquire about the extent to which participants experience difficulty falling asleep, difficulty staying asleep, problems waking up too early, satisfaction with current sleep pattern, and level of distress related to the current sleep problem, using a scale ranging from 0 (*none*) to 4 (*very severe*). The total score ranges from 0 to 28; higher scores indicate more severe insomnia. The ISI has been found to be a reliable and valid instrument to measure perceived insomnia severity (Morin, Belleville, B  langer, & Ivers, 2011).

The Centre for Epidemiologic Studies Depression Scale (CES-D) was used to measure depressive symptoms. The CES-D consists of 20 items (e.g. I was bothered by things that usually don't bother me), each expressing a depressive feeling or behavior. Participants are asked to rate how often they felt or behaved in accordance with each item during the past week, from 1 (*rarely or none of the time; less than one day*) to 4 (*most of the time; 5-7 days*). A score of    16 indicates a "high" level of depressive symptoms. The CES-D has been found reliable for assessing depressive symptoms across different populations and age groups, with Cronbach's alpha coefficients ranging from .85 to .90 (Radloff, 1977).

## Data Analysis

To test whether the MCI was effective in reducing insomnia and depression in individuals with high levels compared to those with low levels of depression, the sample was split into two groups based on the CES-D score obtained at pretest. The high depression group consisted of participants with a score of    16 on the CES-D, and the low depression group consisted of participants with a score < 16 on the CES-D.

To analyze the change in ISI and CES-D scores in the high depression group, a repeated analysis of variance was conducted comparing scores from pretest to posttest between the two treatment groups (MCI or control). The same analysis was done to analyze the change in ISI and CES-D scores in the low depression group.

## Results

Data were obtained from 321 participants who completed pretest and posttest measures of depression and insomnia and who had either participated in the MCI (n=196) or the control treatment (n=125). The distribution of participants with high levels of depression was 29 in the MCI and 77 in the control groups, whereas the number of participants with low depression was 167 in the MCI and 48 in the control groups.

Most (67%) participants were female and the majority (87%) self-identified as Caucasians. Participants ranged in age from 21 to 89 years, with a mean of 50.4 (SD=16.0); 46% of the participants were married. The majority (70%) of the participants were employed, and their

completed years of education ranged from three to 25, with a mean of 16.0 years ( $SD=3.7$ ). Participants had experienced insomnia for 4 months to 50 years, with a mean of 11.0 years ( $SD=10.2$ ).

### Effect of MCI on Insomnia Severity

Table 1 describes the ISI mean scores in the low depression and high depression groups for participants who received the MCI and the control treatment. For participants with high depression ( $F(1, 99)=83.89, p < .001$ ) and low depression ( $F(1, 213)=107.21, p < .001$ ), ISI scores significantly decreased from pretest to posttest ( $p < .001$ ). In the high depression group, there was no significant group (MCI vs. control) by time (pretest to posttest) interaction ( $F(1, 99)=0.52, p > 0.05$ ). However, in the low depression group, there was a significant group (MCI vs. control) by time (pretest to posttest) interaction ( $F(1, 213)=20.06, p < .001$ ). Participants in the MCI group experienced a significantly greater reduction in ISI symptoms over time compared to those in the control group.

### Effect of MCI on Level of Depression Symptoms

Table 2 presents the CES-D mean scores in the low depression and high depression groups for participants who received the MCI and control treatment. For participants with high depression, the CES-D scores significantly decreased from pretest to posttest ( $F(1,104)=12.27, p < .005$ ) in both the MCI and control groups. However, there was no significant group (MCI vs. control) by time (pretest to posttest) interaction effect ( $F(1, 104)=0.29, p > .05$ ). For participants with low depression, CES-D scores did not change significantly over time in either the MCI or the control groups ( $F(1,226)=0.01, p > .05$ ). There was no significant difference between groups over time ( $F(1, 226)=0.08, p > .05$ ).

## Discussion

The present study examined how individuals with high and low depression responded to behavioral intervention for insomnia in terms of their insomnia and depressive symptoms. Overall, participants with low and high levels of depression experienced an improvement in insomnia symptoms following the MCI. This is consistent with the findings of several meta-analyses that have observed cognitive-behavioral approaches for insomnia to be effective for improving sleep outcomes in many populations (Irwin et al., 2006; Morin et al., 2006).

For persons with insomnia and high depression levels, the MCI was effective in significantly reducing symptoms of both insomnia and depression. The improvement in insomnia symptoms is consistent with past research that has found improvements in sleep following CBT-I in individuals with comorbid psychiatric conditions such as depression (Lichstein, Wilson, & Johnson, 2000; Edinger et al., 2009). The observation that MCI was effective for reducing depressive symptoms in addition to insomnia is also consistent with previous findings of studies that used similar behavioral interventions (Germain et al., 2006; Taylor, Lichstein, Weinstock, Sanford, & Temple, 2007; Manber et al., 2011). For persons with low depression, the MCI was effective in significantly reducing insomnia severity, but the level of depressive symptoms was unaffected in this group. The lack of change in levels of depressive symptoms may be due to a floor effect.



The finding that MCI reduced depressive symptom levels in those with high depression does not imply that behavioral therapy for insomnia can completely resolve depressive symptoms or that such therapy could replace current treatment modalities for depression such as pharmacotherapy and psychotherapy specific to depression. However, the findings are certainly promising in understanding how resolving sleep problems may improve depressed mood. The complex relationship between insomnia and depression has been hypothesized as being reciprocal (Taylor, Lichstein, Weinstock, Sanford, & Temple, 2007), where the presence of one disorder can aggravate the other. According to this perspective, reducing one's insomnia symptoms through CBT-I could contribute to decreased severity of depressive symptoms. Alternatively, CBT for depression and CBT for insomnia could be integrated into a multi-component intervention for managing both conditions simultaneously or sequentially.

Interestingly, for participants with high depression in the control group, a significant reduction in both depressive and insomnia symptoms was observed, and this group improved from pretest to posttest very similarly to the MCI group. The observation that the sleep education and hygiene book was effective in reducing insomnia and depressive symptoms in individuals with a high level of depressive symptoms is a unique finding that has not been reported previously. Although three studies' results indicated that CBT-I reduced the levels of depressive symptoms (Germain et al, 2006; Taylor, Lichstein, Weinstock, Sanford, & Temple, 2007; Manber et al., 2011), only Germain et al. (2006) included an information control group similar to the present study. However, pretreatment to posttreatment reductions in insomnia or depressive symptoms were much more significant in the treatment group compared to the control group, a finding that is not consistent with the one obtained in the present study. One possible explanation is that individuals with high depression tend to be more socially isolated (Chou, Liang, & Sareen, 2011). Therefore they may have felt comfortable receiving the sleep hygiene booklet on their own to apply the recommendations that fit best with their lifestyle. Receiving treatment of choice has been found to enhance adherence to and outcome of therapy for depression (Kwan, Dimidjian, & Rizvi, 2010).

In addition to helping individuals with comorbid insomnia and depression, CBT-I may have value in its potential to prevent the onset of depressive symptoms. Previous studies show that, for individuals with comorbid insomnia and depression, insomnia usually occurs first (Johnson, 2006), and individuals with insomnia are significantly more likely to develop depression over time than individuals without insomnia (Perlis et al., 2006; Buysse et al., 2008; Baglioni et al., 2011). Accordingly, insomnia is often an early warning sign of the development of depressive symptoms. Therefore, for individuals who have insomnia and have not yet experienced depression, perhaps reducing their insomnia problem with a behavioral therapy could prevent the eventual onset of depressive symptoms.

### **Implications for Social Work Practice**

Social workers in the mental health field provide services to clients from a wide range of socioeconomic and cultural backgrounds who may have mental health concerns of varying severity. Particularly common mental health conditions in the United States and Canada are

depression (Kessler et al., 1994; Patten et al., 2006) and insomnia (Roth, 2007; Morin et al., 2011). It is crucial to have a variety of treatment options for assisting clients in managing these problems in their everyday life, as every person has different needs and preferences for how they wish to manage their health. Social workers are ideal candidates to deliver cognitive-behavioral interventions as they have been trained in these techniques and have the therapeutic skills to deliver the interventions effectively.

The main finding that behavioral therapy for insomnia is effective at reducing both depressive and insomnia symptoms has implications for practice. Social workers are expected to use evidence-based treatments in the field and be aware of relevant research to guide their practice. The Code of Ethics of the National Association of Social Workers (NASW) asserts that social workers should keep up with emerging knowledge and fully integrate research evidence into their practice (NASW, 2008). Therefore, evidence supporting the efficacy of CBT-I in helping individuals struggling with insomnia and depression suggests that social workers should consider offering this treatment to clients as a viable intervention.

### Limitations

The present study had several limitations. First, measures used to assess insomnia and depressive severity were subjective. The addition of objective measures for depression (e.g. structured clinical interviews) and insomnia (e.g. polysomnography or actigraphy) may have provided a more accurate picture of the severity of these symptoms than the brief self-report measures used. Second, there is an overlap in symptoms between insomnia and depression that may have confounded the findings. The CES-D includes one item related to sleep ("My sleep was restless"). Before treatment, it is likely that many individuals in the study may have rated this item highly, since they were presenting with sleep problems. If the participants found their sleep improved after either the MCI or control treatment, they likely would have rated this item on the depression scale as improved. Future research should eliminate this item to enhance the validity of interpreting an improvement in depressive symptoms.

### Future Research

Additional research could further examine the benefit of CBT-I for individuals with varying levels of depression severity and for other mood disorders such as anxiety and bipolar disorder. Also, it would be interesting to determine the impact of a sleep hygiene intervention for insomnia on insomnia and depression symptom in persons with a high level of depression, to see whether this finding would be replicated and if so, to understand the mechanism underlying its therapeutic effects.

### Conclusions

Individuals with insomnia with varying levels of depressive symptoms significantly benefited from a multi-component behavioral intervention for insomnia in terms of reducing insomnia severity. Those with high depression also experienced a significant reduction in depressive symptoms following the intervention. Individuals with high depression who received the sleep education and booklet also experienced an improvement in insomnia and

depressive symptoms to a similar degree as those who participated in the behavioral intervention. Individuals with low depression who received the booklet did not experience an improvement in insomnia symptoms.

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**Table 1**

Mean (SD) scores for Insomnia Severity (ISI) in Treatment and Level of Depression Groups

	<u>Low Depressive Symptoms</u>		<u>High Depression</u>	
	Pretest	Posttest	Pretest	Posttest
Treatment	16.89(3.76)	10.79(5.24)	19.31(3.87)	13.15(5.78)
Control	15.00(3.94)	12.58(4.57)	19.52(3.92)	14.26(4.84)



**Table 2**

Mean (SD) scores for Depression (CES-D) in Treatment and Level of Depression Groups

	<u>Low Depressive Symptoms</u>		<u>High Depressive Symptoms</u>	
	Pretest	Posttest	Pretest	Posttest
Treatment	8.44(3.84)	8.37(5.15)	23.32(6.95)	18.97(10.25)
Control	8.50(3.82)	8.68(5.40)	20.83(5.40)	17.62(7.70)