

## Review Article

## Cognitive-Behavioural Therapy Improved Quality of Sleep and Reducing Pain among Elderly with Osteoarthritis: Literature Review

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### Abstract

Sleep quality is a major concern among older adults with osteoarthritis, more than eighty percent older adults with osteoarthritis reported sleep problem related pain problem. This literature review purposed to overview evidences of cognitive-behavioural therapy for insomnia older adults with osteoarthritis. Five randomized control trial study was included in this literature review. Cognitive-behavioural therapy for insomnia (sleep hygiene education, stimulus control, sleep restriction, and daily sleep monitoring) involved pain education, physical activation, goal setting, relaxation, activity pacing, guided imagery, and cognitive restructuring were confirmed improved quality of sleep and reducing pain among adult older with osteoarthritis. Cognitive-behavioural therapy for insomnia and pain is recommended in community and clinical setting for older adults with osteoarthritis, moreover, nurse education training on cognitive-behavioral therapy for insomnia and pain is needed for clinical practice.

**Keywords** osteoarthritis, insomnia, cognitive-behavioral therapy

### Introduction

Prevalence of osteoarthritis is rapidly increasing with the accelerating growth of the older population (Buckwalter, 2003). Osteoarthritis demonstrates a broad spectrum of symptom severity, including severe chronic pain, dysfunction and movement limitations, and sleep quality problems and insomnia (Buckwalter, 2003; Dieppe, 2005; Weiner & Cayea, 2005; Schmader & Dworkin, 2005). Studies showed sleep disturbance and insomnia related with chronic pain conditions (Smith & Haythornthwaite, 2004; Morin, 2004). Sixty percent of people with osteoarthritis reporting pain during the night (Foley et al., 2004), eighty percent patients reported trouble maintaining sleep, which is the most frequent insomnia-related symptom in patients with osteoarthritis (Wilcox et al., 2000). Another study demonstrated sleep disruption might

impaired pain modulatory processes, suggesting that sleep disruption may directly amplify osteoarthritis pain (Smith et al., 2007; Lee et al., 2013).

Chronic sleep disturbance and insomnia among older patients with osteoarthritis associated with impaired daytime function, daytime sleepiness and fatigue, reduced quality of life, and increased health care utilization (Montgomery et al., 2003; Simon et al., 1997). Sleep disturbances are often secondary to medical condition and psychiatric comorbidities (Foley et al., 2004; Quan et al., 2005) and are associated with an increased risk for the onset of depression and anxiety, substance abuse, falls, cognitive decline, and suicide (Brassington, Kings, & Bliwise, 2000; Taylor, Lichstein, & Durrence, 2003). Insomnia is associated with impaired cognitive skills, including attention, memory, and vigilance, all of which may

contribute to significant functional impairments (Daley et al., 2009). Insomnia adversely affect physical function, mood, and cognition, and their combined healthcare costs place a substantial economic burden on patients and society (Ozminkowski et al., 2007). The negative impact of insomnia in osteoarthritis patients is contributing to the severity of pain, whether sleep disturbance precedes or follows pain onset is unclear, but reciprocal effects are likely (Smith & Haythornthwaite, 2004). Disturbed sleep in turn maintains and exacerbates chronic pain and related dysfunction (Lautenbacher et al., 2006; Foo et al., 2002) and then pain would be limiting in many ways leading to a loss of function and reduced quality of life (Salaffi et al., 2005; Waters et al., 2005) and also psychological disability (Scopaz et al., 2009).

The treatments for sleep disorders and insomnia are pharmacological treatments approaches and lack of knowledge about non-pharmacological treatment and limited access to other forms of professional help are cited by physicians as the main reason for prescribing sleeping pills (Montgomery & Dennis, 2003). Studies showed educational interventions have been proposed to enhance patients' knowledge of and reduce the barriers to improve patients insomnia management (Morin, 2000; Johansson et al., 2005, Carr, 2007).

Cognitive-behavioral therapy for insomnia (CBT-I), a short-term psychological intervention with well-established evidence-based treatment and have been found efficacy in patients with primary insomnia (Smith et al., 2002; Espie et al., 2009; McCurry et al., 2007; Morin et al., 2004; Siebern et al., 2011). Several studies of CBT-I in patients with chronic pain disorders have demonstrated improves sleep maintenance insomnia (Edinger et al., 2005; Pigeon et al., 2012), eventhough with a variety of comorbid medical conditions, including persons with chronic pain (Belleville et al., 2011; Edinger et al., 2009). Other studies was reported these interventions improved more than seventy percent sleep quality and restoring sleep latency

and also time awake after sleep onset to normative values for adults with chronic insomnia (Morin 1994; Murtagh 1995; Trauer et al., 2015). The purpose of this manuscript is to provide a review of the current literature regarding evidence of cognitive-behavioural therapy for insomnia older adults with osteoarthritis. It is our intent that clinicians use this information to facilitate a intervention approach for the osteoarthritis patients with insomnia.

## Methods

A search of the following electronic databases was conducted: PubMed, Scopus, MEDLINE [Elton B Stevens Company;(EBSCO)], PsycINFO (EBSCO), and the Cumulative Index for Nursing and Applied Health literature (CINAHL) between 2000 and 2019. Randomized controlled trials (RCT) studies was investigate the cognitive-behavioral therapy for insomnia and English language and were included.

## Results

Five randomized controlled trials studies focused on cognitive-behavioural therapy for insomnia older adults with osteoarthritis were included in this literature review. Three studies (Von Korff et al., 2012; Vitiello et al., 2013; McCurry et al., 2014) was conducted with CBT-I plus pain management in osteoarthritis patients. Two studies used CBT-I content's only for osteoarthritis, without education causes and consequences of sleep disturbance or pain in osteoarthritis (Smith et al., 2015; Vitiello et al., 2009). Three studies was measured insomnia used The Insomnia Severity Index (ISI) (Von Korff et al., 2012; Vitiello et al., 2013; McCurry et al., 2014). One study was used sleep log instrument (Vitiello et al., 2009), and one study was used wake after sleep onset (WASO) (Smith et al., 2015). The range of session for intervention are between six weeks (Von Korff et al., 2012; Vitiello et al., 2013; McCurry et al., 2014) and eight weeks (Smith et al., 2015; Vitiello et al., 2009). Included studies summarized in table 1.

**Table 1. Studies included**

N o	Name (Year)	Title of the study	Desig n	Sessi on	Interve ntion	Sample size Age	Follow-up period	Measu rement	Outcome
1	Smith et al., (2015)	Cognitive– Behavioral Therapy for Insomnia in Knee Osteoarthritis	RCT	8 weekl y group sessio ns	CBT -I	100 patients (mean±S D Age 59.4±9.5 years)	Baseline, Post- treatment, 3 months, and 6 months.	WASO	CBT-I was efficacious in reducing sleep maintenance insomnia.
2	Vitiello et al., (2009)	Cognitive Behavioral Therapy for Insomnia Improves Sleep and Decreases Pain in Older Adults with Co-Morbid Insomnia and Osteoarthritis	RCT	8 weekl y group sessio ns	CBT -I	23 patients CBT-I (mean age 69.2 years) and 28 patients (mean age 66.5 years) to an attention control.	Baseline, after treatment, and at 1- year follow-up	Sleep log	CBT-I but not an attention control, without directly ad- dressing pain control, improved both immediate and long-term self- reported sleep and pain in older patients with osteoarthritis and co-morbid insomnia
3	Von Korff et al., (2012)	Group Interventions for Co-Morbid Insomnia and Osteoarthritis Pain in Primary Care: The Lifestyles Cluster Randomized Trial Design	RCT	Six weekl y group sessio ns	CBT-I plus pain manage ment	367 participa nts age 60 years or older	Approxima tely 2 months after enrollment (post- interventio n assessment ) and 9 months	The Insomn ia Severit y Index (ISI)	This hybrid efficacy- effectiveness trial design evaluates whether interventions yield specific benefits for clinical and behavioral outcomes relative to an education only control when implemented in a primary care setting.
4	Vitiello et al., (2013)	Cognitive- Behavioral Treatment for Comorbid Insomnia and Osteoarthritis Pain in Primary Care: The Lifestyles Randomized	RCT	Six weekl y group sessio ns	CBT-I plus pain Manag ement	122 patients (mean±S D Age 73.2±8.1 years)	Baseline, posttreatm ent, and 9- month assessment s	The Insomn ia Severit y Index (ISI)	CBT of insomnia was effective for older adults with OA pain and insomnia

		Controlled Trial							
5	McCurry et al., (2014)	Who Benefits From CBT for Insomnia in Primary Care? Important Patient Selection and Trial Design Lessons from Longitudinal Results of the Lifestyles Trial	RCT	Six weekly group sessions	CBT-I plus pain management	101 patients age 60 y or older	Baseline, 2-mo (posttreatment), 9-mo, and 18-mo followup assessments	The Insomnia Severity Index (ISI)	Results suggest patients with higher levels of comorbid pain and insomnia may be most likely to experience sustained benefit from cognitive behavioral therapy interventions over time, and inclusion of insomnia treatment may yield more clinically meaningful improvements than cognitive behavioral therapy for pain alone.

CBT-I, Cognitive-behavioral therapy for insomnia, WASO, wake after sleep onset, The ISI, Insomnia Severity Index

### Intervention program for insomnia among older adults with osteoarthritis

Varied study used different Cognitive-behavioral therapy (CBT) program. Smith et al., (2015) and Vitiello et al., (2009) studies were used CBT for insomnia (CBT-I) program administered eight weekly group sessions. The CBT-I intervention protocol session included a didactic presentation, a question-and-answer period, a review of each individual's sleep log, and group discussion to solve problems encountered during implementation of the techniques. The two main behavioral components, stimulus control and sleep restriction were introduced and emphasized during the first 3 sessions. A strict schedule of bedtimes and arising times was prescribed to consolidate sleep and decrease time spent awake during the night. The third component to be introduced was cognitive restructuring, which emphasized changing unrealistic beliefs and irrational fears regarding

sleep or loss of sleep. The fourth component was relaxation training, designed to decrease anxiety and reduce cognitive and physiologic arousal at bedtime. final component of the intervention was sleep-hygiene education, including the use of increased daytime bright-light exposure to address any circadian causes of insomnia. Topics included increasing natural-light exposure, daytime activity, and exercise; reducing caffeine and alcohol intake; keeping an appropriate bedroom temperature; reducing ambient noise in the bedroom; using warm baths in the evening; and using appropriate food choices and eating patterns. The CBT-I treatment condition made no mention of pain management (Smith et al., 2015; Vitiello et al., 2009).

Three studies (Von Korff et al., 2012; Vitiello et al., 2013; McCurry et al., 2014) were used six session cognitive-behavioral pain coping skills intervention for osteoarthritis pain and insomnia

(CBT-PI). CBT-PI included standard components of CBT-I (sleep hygiene education, stimulus control, sleep restriction, and daily sleep monitoring) added the CBT for pain (CBT-P) intervention; including pain education, physical activation, goal setting, relaxation, activity pacing, guided imagery, and cognitive restructuring (Von Korff et al., 2012; Vitiello et al., 2013; McCurry et al., 2014).

### **Description of the intervention**

Cognitive-behavioral therapy for insomnia (CBT-I), a short-term psychological intervention with well-established efficacy in patients with primary insomnia (Morin, 2004). Cognitive and behavioural treatments for insomnia by (1). Changing poor sleep habits, regulate sleep-wake schedule (2). Challenging negative thoughts attitudes and beliefs about sleep. Cognitive-behavioural interventions include a broad range of treatments, from educational packages to purely behavioural strategies. The approach to CBT-I has been refined in recent years, and it is now most commonly studied as a combined cognitive and behavioral treatment incorporating some or all of 5 component (Morin, 2004; Trauer et al., 2015). The protocol CBT-I summarized in table 2.

### **Component of Cognitive-behavioural interventions**

#### **1. Stimulus Control**

Stimulus control (Morin, 2004; Trauer et al, 2015) involves a set of instructions aimed at helping the individual to re-associate the bed, bedtime and bedtime stimuli with sleep rather than with the frustration or anxiety resulting from lying in bed trying to sleep. Participants are instructed to (1) only go to bed when sleepy; (2) only to use the bed for sleeping and sex; (3) to leave the bed if they have not gone to sleep within 15-20 minutes and to go back only when feeling sleepy again, to be repeated as often as necessary through the night; (4) to get up at the same time each morning regardless of the amount of sleep achieved in the previous night; and (5) not to sleep during the day.

#### **2. Sleep Restriction Therapy**

A common treatment is sleep restriction therapy (Morin, 2004; Trauer et al, 2015). This method limits the time spent in bed at night and restricts

sleep during the day. Participant estimate an allowable time in bed from the diaries kept over the previous two weeks. For example, if a person spends eight hours in bed and only actually sleeps for six of them, their allowed time in bed would be six hours. Weekly adjustments are made to this amount by looking at the individual's sleep efficiency (ratio of total sleep time to time spent in bed). When sleep efficiency reaches 90%, the time allowed in bed increases by 15-20 minutes. These adjustments continue until the expected optimal amount of sleep time is reached. The urge to sleep will be increased during each stage of the treatment and in this way it is thought to increase the homeostatic drive for sleep. This type of treatment is considered likely to be effective with older people, many of whom may have tried to compensate for their poor sleep by spending more time in bed.

#### **3. Sleep Hygiene Education**

Sleep hygiene education aims to teach individuals about the impact of lifestyle habits such as diet, exercise and drug use and the influence of environmental factors e.g. light, noise and temperature. While these issues are unlikely to cause insomnia (Morin, 2004; Trauer et al, 2015) they may well exacerbate it. Studies generally advocate (1) the avoidance of caffeine and nicotine (both stimulants) in the 6 hours before bed; (2) the avoidance of alcohol around bed time (alcohol may facilitate sleep onset but it tends to cause fragmentation of sleep and night mares); (3) the avoidance of a heavy meal before sleep (although a light meal may be helpful); (4) the avoidance of exercise close to bed-time (even though in general exercise is helpful for sleep); and (5) the minimisation of noise, light and excessive heat during the sleep period. Sleep hygiene also includes information concerning age-appropriate sleep duration to ensure realistic expectations.

#### **4. Relaxation**

Any relaxation technique that the patient finds effective can be used to limit cognitive arousal and reduce muscular tension to facilitate sleep. Specific techniques that may be used include meditation, mindfulness, progressive muscle relaxation, guided imagery, and breathing techniques (Trauer et al, 2015)

## 5. Cognitive therapy

This aims to identify, challenge, and replace dysfunctional beliefs and attitudes about sleep and insomnia. Such misconceptions may include unrealistic expectations of sleep, fear of missing out on sleep, and overestimation of the consequences of poor sleep (Trauer et al, 2015)

### Discussion

This literature review study were confirmed CBT-I improved sleep quality of older person with osteoarthritis and co-morbid insomnia, it is concluded that CBT-I, without specifically addressing pain management, appeared to reduce both immediate and long-term reported pain in these patients (Vitiello et al., 2009). Smith et al., (2015) findings strongly support the efficacy of CBT-I for treating insomnia in patients with osteoarthritis, however improvements in sleep with reduce clinical pain not strongly concluded because of contributed traditional pharmacologic placebo bias in the control group for this study. CBT-I, a short-term psychological intervention with well-established efficacy in patients with primary insomnia (Smith et al., 2002). Evidence-based treatment studies have been reported CBT-I reported positive effects on sleep quality (Espie, 2009; McCurry et al., 2007; Morin et al., 2006; Siebern & Manber 2011; Morin et al., 1999). CBT-I was developed as a psychological intervention to target the perpetuating factors of insomnia, it is a short-term, multi-component

treatment, comprised of behavioral and cognitive techniques (Morin & Espie, 2003; Perlis & Lichstein, 2003) and typically conducted over the course of four to eight sessions (Morin et al., 2006), with a focus on psycho-education, behavioral and cognitive strategies (Edinger & Carney, 2008). Treatment often includes: stimulus control, sleep restriction, cognitive therapy, sleep hygiene, and relaxation training

CBT-PI was associated with more-favorable outcomes for self-reported insomnia severity. Patients with higher levels of comorbid pain and insomnia may be most likely to experience sustained benefit from cognitive behavioral therapy interventions over time, and inclusion of insomnia and pain (Von Korff et al., 2012; Vitiello et al., 2013; McCurry et al., 2014). Finally, CBT-I improved quality of sleep in individuals with chronic pain, moreover CBT-PI have positive benefits for higher levels of comorbid pain and insomnia.

**Implications for nursing practice;** CBT-I has been reported as a first line treatment given its long-term efficacy (Espie, 2009) and recommended approaches improved sleep quality and quantity in older adults with osteoarthritis. However, skill training is needed for nurse for this intervention and also patient cooperation absolutely and high commitment between patients and therapist needed in this program.

**Table 2: The six session Cognitive-behavioral therapy for insomnia by Vitiello et al., (2009)**

Session	Treatment description
1 <sup>st</sup> -3 <sup>rd</sup> (Stimulus control & Sleep restriction)	<ul style="list-style-type: none"> <li>This approach is based on the assumption that both the timing (bedtime) and sleep setting (bed/bedroom) are associated with repeated unsuccessful sleep attempts and, over time, become conditioned cues for arousal that perpetuate insomnia. As a result, the goal of this treatment is that of re-associating the bed and bedroom with successful sleep attempts</li> <li>In practice, this therapy requires instructing the patient to: (a) go to bed only when sleepy; (b) establish a standard wake-up time; (c) get out of bed whenever awake for long periods; (d) avoid reading, watching TV, eating, worrying and other sleep incompatible behaviors in the bed/bedroom; and (e) refrain from daytime napping.</li> <li>Stimulus control instructions usually can be administered in one visit, but follow-up visits to facilitate compliance are beneficial</li> <li>Sleep restriction therapy reduces nocturnal sleep disturbance primarily by restricting the time allotted for sleep each night so that, eventually, the time spent in bed closely matches the individual's presumed sleep requirement.</li> </ul>

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•	This treatment typically begins by calculating the individual's average total sleep time (ATST) from a sleep log that is kept for 1 to 2 weeks.
•	An initial time-in-bed (TIB) prescription may either be set at the ATST or at a value equal to the ATST plus an amount of time that is deemed to represent normal nocturnal wakefulness (e.g., ATST+30 min). The initial TIB prescription is seldom set below 5 h per night.
•	On subsequent visits TIB may be adjusted up or down in 15 to 30 min increments dependent upon the patient's sleep performance and waking function.
•	Therapy typically entails an initial visit to introduce treatment instructions and follow-up visits to alter TIB prescriptions.

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4 <sup>th</sup> Relaxation section	<ul style="list-style-type: none"> <li>• Various techniques used to treat PI including progressive muscle relaxation, passive relaxation, autogenic training, biofeedback, imagery training, meditation, and hypnosis.</li> <li>• The therapy goal is to reduce or eliminate sleep-disruptive physiological (e.g., muscle tension) and/or cognitive (e.g., racing thoughts) arousal.</li> <li>• Regardless of the specific relaxation strategy employed, treatment typically entails conducting specific treatment exercises and teaching relaxation skills over multiple treatment sessions</li> </ul>
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5 <sup>th</sup> Cognitive therapy	<ul style="list-style-type: none"> <li>• This aims to identify, challenge, and replace dysfunctional beliefs and attitudes about sleep and insomnia. Such misconceptions may include unrealistic expectations of sleep, fear of missing out on sleep, and overestimation of the consequences of poor sleep.</li> </ul>
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6 <sup>th</sup> Sleep hygiene education	<ul style="list-style-type: none"> <li>• Patients are educated about healthy sleep behaviors and sleep-conducive environmental conditions. Typically they are encouraged to exercise daily, eliminate the use of caffeine, alcohol, and nicotine, eat a light snack at bedtime, and ensure that the sleeping environment is quiet, dark, and comfortable.</li> <li>• Sleep hygiene is seldom used as a primary intervention, but is often included with other interventions</li> </ul>
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**Acknowledgements:** The authors would like to thank University 'Aisiyah Yogyakarta, Indonesia research department

**Funding:** University 'Aisiyah Yogyakarta, Indonesia Research Funding

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