



# Improving sleep quality interventions among menopausal women with sleep disturbances in Taiwan: a preliminary study



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## ABSTRACT

**Aim:** The aim of this study was to evaluate the effectiveness of improving sleep quality interventions in menopausal women with sleep disturbance.

**Background:** Sleep disturbances are an extensive and common problem among menopausal women. There is an increased trend in the use of non-pharmacological methods to alleviate sleep disturbances. Studies that have implemented two or more non-pharmacological strategies for menopausal women are scant.

**Methods:** A repeat measurement with a randomized assignment was conducted. A total of 59 menopausal women with sleep disturbance were recruited and randomly assigned to experimental ( $n = 29$ ) and control ( $n = 30$ ) groups. Participants in the experimental group received four 2-hour improving sleep quality activities, whereas the control group received regular greeting calls. Sleep quality was measured prior to intervention, and on the 5th and 8th weeks by using the Pittsburgh's Sleep Quality Index, and Actiwatch was worn before and during the 8 weeks of intervention. Generalized estimating equation was used to analyze data.

**Results:** The results revealed that subjective sleep quality had significant main effect in group and time. The findings of the objective measurement showed that participants in the experimental group had significantly shorter frequency of awakening time and increased sleep efficiency.

**Conclusion:** The improving sleep quality intervention is a healthy and cost-effective method to improve sleep quality in community-dwelling menopausal women with sleep disturbance.

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## 1. Introduction

Menopausal women face a crucial transitional time in life. During this period, women undergo substantial biological, psychological, and social changes. This includes gradual physiological degeneration, and a considerable decrease in the production of sleep quality-regulating hormones such as estrogen and progesterone. In addition, because women have different social and cultural expectations than men (Senba & Matsuo, 2010), the multi-faceted phenomenon produces changes in the sleep-controlling neuroendocrine system, causing sleep disorders (Manocha, Semmar, & Black, 2007). Studies done on the prevalence of menopausal symptoms have reported that approximately 20 to 60% of menopausal women complain about having sleep disorders (Eichling & Sahni, 2005; Moilanen et al., 2010; Woods & Mitchell,

2005), indicating the prevalence and severity of sleep-related problems. It is extremely crucial to care for the health of menopausal women because menopausal women with long-term sleep disturbances will ultimately exhibit comparatively poorer physiological and mental health and a deteriorating quality of life. These problems initiate a vicious cycle that will negatively impact the quality of their life in later years.

In recent years, studies on improving the sleep quality of menopausal women have garnered increased attention. Ong, Shapiro, and Manber (2008) indicated an increased trend in the use of non-pharmacological methods to alleviate sleep disturbances. It is generally believed that the combined use of multiple behavioral techniques to improve sleep quality is more effective than a single technique. However, current solutions introduced in most studies employ only a single intervention to improve the sleep disturbance experienced by menopausal women (Elavsky & McAuley, 2007; Senba & Matsuo, 2010). Studies that have implemented two or more intervention strategies are scant. When considering the intervention strategies used to improve the sleep quality of menopausal women, these strategies must also reduce the pressure that menopausal women experience because of both physiological and mental changes, while easing the sleep problems caused by neuroendocrine changes. Therefore, a set of strategies to improve sleep quality primarily focused on reducing pressure by engaging in self-relaxation exercises was used in this study. The strategies included stress-relieving low-intensity exercises, meditation with diaphragmatic

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breathing, progressive muscle relaxation, and sleep hygiene education. These approaches were modeled on some previous studies which have found significantly reducing the level of nervous tension (Kaul, Passafiume, Sargent, & O'Hara, 2010). Notably, the social cognitive theory is a useful behavioral theory to improve health care outcomes (Bandura, 1986). Therefore, the intervention was informed by the social cognitive theory to improve the sleep quality of menopausal women.

## 2. Background

Meditation is used to train individuals to focus on a single object, voice, or experience (Cardoso, Souza, Camano, & Leite, 2004). By meditating, the awareness of the body is lowered, the intensity of the circulating hormones created by pressure is changed, and the activities associated with the sympathetic nervous system, such as the beating of the heart, breathing, and hot flashes are reduced. In addition, by correctly and continuously practicing meditation, individuals can enhance the  $\alpha$  wave in their brain, which eliminates worry and reduces tension. This achieves mental stability and enhances sleep quality (Kaul et al., 2010; Manocha et al., 2007). A number of sleep-related studies have used meditation as the intervention strategy to help people with sleep disorders. Results showed a significant decrease in total awake time during the night, which improved sleep efficiency and sleep quality (Ong et al., 2008; Ong, Shapiro, & Manber, 2009).

The efficacy of stress-relieving exercises to reduce pressure and divert attention away from stressful events has been extensively documented (Ghoncheh & Smith, 2004; Kwekkeboom & Gretarsdottir, 2006). The exercises primarily entail the stretching of selected muscles to a maximum distance before holding still for 10 seconds and then slowly relaxing each muscle. Concurrently, the individuals rhythmically breathe in and out to produce anxiety-diversion and pressure-reduction effects. Moreover, diaphragmatic breathing has long been considered the simplest and easiest technique to learn. By engaging in diaphragmatic breathing, the parasympathetic nervous system is excited and physiological and mental stimulations are reduced, immediately achieving the effect of pressure reduction when stressful events are forthcoming (Consolo, Fusner, & Staib, 2008; Kwekkeboom & Gretarsdottir, 2006).

Regarding the progressive muscle relaxation technique, it has also been proven by empirical studies to have a multileveled positive effect on people experiencing physical and psychological discomfort (Rausch, Gramling, & Auerbach, 2006). The progressive muscle relaxation technique primarily involves the gradual tightening of the muscles from head to toe for 15 seconds and then the relaxation of the muscles for approximately 30 seconds. This technique can help control anxiety and create a physiological hypo-arousal effect (Rausch et al., 2006). Furthermore, sleep hygiene can help individuals with insomnia identify appropriate ways to correct their lifestyle choices and improve their sleep quality (Lynch, Jarvis, DeBellis, & Morin, 2007). Adachi, Sato, Kunitsuka, Hayama, and Doi (2008) conducted a longitudinal study and follow-up with the participants 1 year after the experiment also showed substantial sleep quality improvement. Thus, Adachi et al. recommended sleep hygiene education to encourage people to change unhealthy behaviors for improving their sleep quality. The purpose of this study was to evaluate the effects of improving sleep quality intervention on sleep disturbance through subjective and objective parameters in menopausal women. It was expected that menopausal women receiving interventions would experience enhanced sleep quality.

## 3. Methods

### 3.1. Design

This study adopted a repeat measurement with a randomized assignment and a controlled trial. Sixty-three participants were

randomly assigned into two groups in a 1:1 ratio by neighborhood to avoid diffusion of treatment effect. The investigator drew from two sealed envelopes determining which participants would be in the experimental group and which in the control group. The experimental group received four 2-hour sleep quality-improvement intervention activities whereas the control group received only regular care or greeting calls. Upon completing these activities, the same sleep intervention teaching materials were given to the control group. The investigator explained the results of the sleep data of each participant that was collected from three questionnaires and two sleep-recording watches.

### 3.2. Participants

Menopausal women with sleep disturbance were recruited from one of the townships in Central Taiwan. The GPower3.05 software was used to estimate the sample size and perform statistical tests on the two groups through ANOVA-repeat measure-between factors. The value of  $\alpha$ , power, Cohen's rule effect size, and a medium autocorrelation were set at 0.05, 0.8, 0.3, and 0.5 respectively. An ideal sample size was 62, with each group comprising 31 members. By conducting a women's health lecture, posting flyers, and receiving referrals, 84 volunteers who were community-dwelling menopausal women were recruited. After removing 21 participants who failed to satisfy our inclusion criteria, the final number of participants was 63. Inclusion criteria were: (1) be between 45 and 60 years of age, (2) experience sleep difficulty for at least 3 days a week over the past month, (3) have a total score higher than five on the Pittsburg sleep quality index, (4) have no mental illness or severe illness such as cancer, heart disease, or lung disease, and (5) be willing to participate in an 8-week intervention activity. Exclusion criteria were: (1) have a habit of using sedatives, hypnotic drugs, or hormone medication, and (2) attend or are still attending sleep improvement-related lessons within the past 6 months. During the intervention period, three participants from the experimental group and one from the control group had to drop out of the study. Therefore, the remaining participants in the experimental and control groups successfully completing the study were 29 and 30, respectively (Fig. 1).

### 3.3. Intervention

The theoretical framework for intervention program which primarily focused on reducing stress and promoting self-relaxation was based on the social cognitive theory. In the first lesson, the investigator introduced information concerning menopausal women with sleep disturbance and explained the sleep-improvement intervention program. In the second lesson, the participants were taught eight stress-relieving exercises, followed by meditation and learning how to focus on diaphragmatic breathing. A stress-relieving exercise expert was invited to the lesson for guidance and consultation. Lecture notes containing the program content were provided to each participant, including a reminder to practice at home at least 30 minutes daily. Next, the investigator made an Intervention At-Home Practice Log and required each participant to set goals and self-monitor their practice time, frequency, and any difficulties they experienced as references for assessment as well as solve problems.

In the third lesson, the participants were divided into groups containing three to five members. During the lesson, the progressive muscle relaxation video was played to teach the participants how to relax their muscles and instruct them on how to duplicate the movements they heard on the CD. Additionally, the investigator provided the participants with a progressive muscle relaxation CD. The CD taught them how to lie still in bed 30 minutes before going to sleep by following the instructions to slowly relax and guide themselves to sleep. In the fourth lesson, the investigator gave each group a sleep hygiene education booklet. These provided them with information that could improve

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