



Feature Article

Effects of social activation and physical mobilization on sleep in nursing home residents



Joachim Kuck^{a,*}, Michaela Pantke^a, Uwe Flick, PhD^b

^aAlice Salomon University of Applied Sciences, Alice-Salomon-Platz 5, 12627 Berlin, Germany

^bDepartment of Education and Psychology, Free University of Berlin, Berlin, Germany

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ABSTRACT

Age-related changes in sleep physiology, frequent occurrence of health impairments, and a sedentary lifestyle make nursing home residents particularly vulnerable to sleep disturbances. Despite the high prevalence of sleep disturbances in nursing homes, there is a lack of research concerning the use of non-pharmacological approaches for improving residents' sleep. This study aimed to promote residents' sleep by improving their social activation and physical mobilization. An experimental group of residents attending an activation program four times a week during an eight-week study course was compared to a non-treated control group in a cluster-randomized intervention trial among 85 residents of 20 nursing homes. Sleep was assessed by the Insomnia Severity Index (ISI), nurses' ratings of residents' sleep disturbances and actigraphy-based sleep parameters. Although no changes in actigraphy-based sleep parameters were observed, the subjective sleep quality ratings of the intervention participants significantly improved compared to the control group members ($p = 0.004$). This study suggests that physical mobilization and social activation may improve residents' subjective sleep quality. Further efforts to improve residents' sleep by increasing their physical and social activity should consider existing obstacles to encourage participation and adherence to the program.

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Sleep disturbances are highly common among elderly adults living in nursing homes.¹ An age-dependent predisposition, medical and psychiatric illness and inactive behavior contribute to the high prevalence of sleep problems among residents.

Changes in sleep with age

With increasing age, total sleep time and, especially, time spent in deep sleep decreases. The physiology of sleep in elderly adults is characterized by fragmentation, more frequent nocturnal awakenings, and a tendency for daytime napping. Elderly adults show a tendency to spend more time in bed, even in daytime, without using the time in bed for sleeping efficiently.^{2,3}

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* Corresponding author. Tel.: +49 (30) 992 45 364.

E-mail address: kuck@ash-berlin.eu (J. Kuck).

Medical and psychiatric conditions

In addition to altered sleep patterns, elderly adults are at higher risk of developing diseases or medical conditions that are highly comorbid with sleep disturbances. Late life insomnia frequently occurs in association with a neuropsychiatric illness, such as dementia, depression, or anxiety disorders.^{4,5} Somatic conditions, such as cardiovascular diseases, chronic pain and nocturia, which become more prevalent with increasing age, may also cause sleep disturbances. Because of high morbidity, they often use multiple drugs concomitantly. Polypharmacy increases the risk of using stimulating drugs, which may also negatively affect the quality of sleep.⁶

Environmental conditions contributing to sleep disturbances

In nursing homes, there are additional environmental and institutional factors that may also contribute to residents' poor sleep. Living in a nursing home encourages inhabitants to have an inactive lifestyle characterized by a lack of physical activity, little social contact, and extended time spent in bed. During the daytime, residents often spend limited time outdoors, causing bright

light exposure to be reduced as a result.^{6,7} Daylight, as well as physical and social activities, are crucial time cues (Zeitgeber) that help regulate the sleep-wake rhythm by strengthening the entrainment of the circadian pacemaker in the suprachiasmatic nucleus (SCN). This circadian system synchronizes the internal sleep-wake rhythm with local day and night times based on the perception of external stimuli. This system functions as a “biological clock,” causing tiredness at approximately the same time in the evening. In addition to the circadian system, the homeostatic sleep drive is the second important sleep regulation mechanism. The homeostatic sleep pressure progressively increases during wakeful activities.⁵ A lack of physical mobilization and social contact in residents’ lives often results in the flattening of their circadian rhythm and reduced need for sleep in the evening.⁶ Therefore, a promising approach to treating insomnia in the elderly is to compensate for the lack of environmental cues by offering additional physical exercise or social activation. Compared with a medical treatment for sleep disturbances, this approach has various advantages and no side effects and may sustain sleep improvement over time if a persistent alteration in residents’ behavior succeeds.

Promoting residents’ sleep by activation

Alessi et al⁸ evaluated the effects of physical activities on sleep quality in nursing home residents and found that sleep efficiency (percentage of time in bed spent asleep) improved with an activation program lasting 14 weeks. In another study, subjective sleep quality in older adults was enhanced by morning and evening structured activity sessions.⁹ A study that evaluated the impact of an individualized social activity intervention on dementia residents’ sleep documented a reduction in daytime napping and an improved day/night sleep ratio among intervention participants.¹⁰ The results of a recent trial suggest that it might be particularly promising to offer the residents a combined intervention comprising physical exercises with social activity. Richards et al¹¹ achieved a statistically significant improvement of residents’ total sleep time (TST) from 302.8 min at baseline to 362.2 min at follow-up in intervention participants compared to a virtually unchanged TST in a “usual care” control group (341.8 min at baseline and 340.4 min at follow-up; $p = 0.01$). The combined intervention comprised strength training or walking five days a week and social activity five days a week. In contrast to the combination therapy in the Richards et al study, the monotherapy branches of physical mobilization or social activation alone each failed to establish significant effectiveness.

However, the intensive and complex intervention by Richards et al may not be feasible in daily nursing home care. The intervention program lasted one and a half hours to almost 2 h each day five days a week. Furthermore, pneumatic fitness machines, which are usually not available in nursing homes, were used for the physical exercises. Additionally, the individualized social program placed high demands on the nursing facilities because 113 different activities were offered to the participants.

Therefore, we see a need to design and evaluate an intervention that could actually be replicated in real world settings. The intervention was aimed at improving residents’ sleep quality by offering social and physical group activities lasting 45 min four times a week during an eight-week study course. The rationale behind the intervention was to maximize sleep duration and minimize sleep latency and nocturnal awakening by enhancing homeostatic sleep drive and strengthening the entrainment of the circadian rhythm.¹⁰

Methods

Study centers

This cluster randomized intervention trial was intended for long-term care facilities in the Berlin area with a capacity of more than 50 beds and facilities that were not specialized or restricted to a particular care need. Nursing home facilities were enrolled in the study from April 2012 until May 2013. A block randomization scheme was used to allocate the cooperating nursing homes either to the intervention group or to the control group by chance. An independent third party generated the randomization sequence inaccessible to the research team. An internet-based random sequence generator, random.org, was applied to a one-to-one allocation using block sizes varying between two and six.

Participants

Residents were eligible to participate in the study if they had difficulty falling asleep or staying asleep or suffered from non-restful sleep at least once a week as assessed by the nurses. Additionally, they could only have mild to moderate cognitive impairment according to the MDS Cognitive Performance Scale,¹² and they had to be physically able to participate in the exercise program. Furthermore, various medical conditions were considered exclusion criteria (e.g., recent heart attack, acute heart failure, coronary artery disease with unstable angina, aortic stenosis, severe COPD and phlebitis/thrombosis in the last four weeks), which prevented residents from participating in the trial. Nurses from the participating care facilities acted as persons of trust and gatekeepers. They preselected potential study participants according to the inclusion and exclusion criteria of the trial and established contact between interested residents and the research team. After verification of study eligibility and signing an informed consent form, the residents were enrolled in the study. A medical certificate from the attending physician was obtained for all members of the intervention group at baseline to ensure that participation in the training was without health risk.

Sample size calculation accounted for cluster-randomization by an estimated variance inflation factor of 1.7, assuming an intraclass correlation coefficient (ICC) of 0.05.^{13,14} According to Alessi et al⁸ who had managed to increase sleep efficiency of nursing home residents by approximately one-tenth in a non-pharmacological trial, it was determined that the study needed 204 participants to detect an improvement of 10% in sleep efficiency with a power of 80% using a two sided test at $\alpha = 0.05$.

Physical and social activation program

The activity program included two sessions of social activity and two sessions of physical training spread across four days each week during an eight-week study course (see Table 1). One session lasted 40–45 min, and there was always at least one day of rest between two physical training sessions. Social and physical activation were provided by qualified occupational and physical therapists, respectively, to groups of three to eight residents. Group activities, exercises to promote memory, fine motor skill games, and conversations were part of the structured social activity program. An occupation-based and client-centered approach was adopted in the social activity program to promote residents’ communication and social interaction skills. In the physical training, study participants performed exercises to promote balance, strength, and endurance using small-scale gymnastic equipment, including Swiss balls,

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