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The Effect of a Combination Progressive Muscle Relaxation and Foot Massage on Improving Sleep Quality in the Elderly

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ABSTRACT

Introduction: *A periodic and persistent sleep deprivation can have a direct impact on the health of the elderly. Poor sleep quality in elderly can be managed through both pharmacological and non-pharmacological therapies, including progressive muscle relaxation and foot massage. This study aimed to analyse the effect of a combination of progressive muscle relaxation and foot massage on improving sleep quality among the elderly at the Al-Ishlah elderly Care Home in Malang City* ***Method:*** *This study used a pre-experimental design with a one-group pretest-posttest approach. The sampling technique used purposive sampling with a total of 20 elderly respondents who experienced poor sleep quality. The instrument used to measure sleep quality was the Pittsburgh Sleep Quality Index (PSQI). The intervention was given seven times consecutively in one week.* ***Result****: The results showed that before the intervention, all respondents (100%) had poor sleep quality (PSQI score >5). After the combination therapy, all respondents (100%) experienced an improvement in sleep quality to the good category (PSQI score ≤5). The Wilcoxon test showed a significance value (2-tailed) of 0.000 (<0.05), indicating a significant difference in sleep quality scores between before and after the intervention. In conclusion, the combination of progressive muscle relaxation and foot massage significantly improved sleep quality among the elderly.* ***Conclusion*** *These findings have important implications for nursing practice, particularly as a safe, easy-to-implement, and non-pharmacological nursing intervention that can be performed independently to improve sleep quality in the elderly. This therapy is recommended for routine implementation and further investigation in future studies by considering other variables that influence sleep quality in the elderly.*

Introduction

Advanced age is the aging process that begins at the age of 60 and above and is the final stage of human development (Nurjamilah et al., 2024). This process affects various aspects of elderly lives, including physical, cognitive, psychological, social, and emotional aspects, which can cause various problems such as decreased mobility, risk of falling, urinary incontinence, sleep disorders, depression, hearing and vision impairment, dementia, decreased immune function, and sexual dysfunction (Nurratri & Pardilawati, 2023).

Sleep disorders are among the most common health problems experienced by the elderly. Poor sleep quality ranks as the third most frequent complaint among older adults after headaches and digestive disorders (Nasiri et al., 2024). In Indonesia, the prevalence of poor sleep quality among elderly individuals aged 60 years and above remains high, reaching approximately 67%. In Malang City, 41.3% of elderly individuals have been reported to experience poor sleep quality, while another study reported a higher prevalence of 55.6% (Noviyanti & Istiqomah, 2021). A more concerning condition was found at the Al-Ishlah Elderly Home in Malang City, where approximately 90% of elderly residents experienced poor sleep quality. These data indicate that sleep disorders among the elderly constitute a significant health problem that requires serious attention.

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The high prevalence of sleep disorders in the elderly is influenced by various physical and psychological changes resulting from degenerative processes, including changes in the musculoskeletal, neurological, and psychosocial systems. Neurological changes occur along with a decrease in the number of neurons and neurotransmitters that play a role in regulating the sleep-wake cycle, thereby impacting sleep quality.

Poor sleep quality in the elderly can be managed through non-pharmacological approaches. Non-pharmacological therapy is recommended because it is relatively safe and does not cause dependence when used in the long term (Farrar & Farrar, 2020). Foot massage is a complementary therapy that is easy to perform, as it only requires the use of hands and does not require assistance from others (Nurjamilah et al., 2024). A study by Haryono (2024) reported that prior to foot massage therapy, all respondents (100%) had poor sleep quality, whereas after the intervention, all respondents (100%) demonstrated good sleep quality. Progressive muscle relaxation is a relaxation technique that combines deep breathing exercises with a series of specific muscle contraction and relaxation movements. A study by Gurning & Sari (2020) found that progressive muscle relaxation had a significant effect on improving sleep quality in the elderly. Progressive muscle relaxation and foot massage are two non-pharmacological interventions that have been proven separately to be effective in promoting relaxation, reducing muscle tension, improving blood circulation, and stimulating the parasympathetic nervous system, which plays an important role in the sleep process (Azmi et al., 2021). Theoretically, combining these two interventions is expected to produce a synergistic effect by enhancing both physical and psychological relaxation, thereby potentially resulting in greater improvements in sleep quality compared to single-therapy interventions.

However, most previous studies have focused on the effectiveness of progressive muscle relaxation or foot massage as individual interventions. Scientific evidence regarding the combined effect of these two interventions on sleep quality in the elderly remains limited. Therefore, this study was conducted to examine the effect of a combination of progressive muscle relaxation and foot massage on improving sleep quality among the elderly.

Methods

The research design employed a pre-experimental method with a one-group pretest-posttest approach to examine the effect of a combination of progressive muscle relaxation and foot massage on sleep quality among the elderly by comparing sleep quality scores before and after the intervention. A limitation of this design is the absence of a control group, therefore, causal relationships cannot be fully established. The study was conducted at Al-Ishlah Elderly Home, Malang City, over a period of seven consecutive days, from February 24 to March 2, 2025.

The population of this study consisted of all elderly residents aged ≥60 years at Al-Ishlah Elderly Home, totaling 25 individuals. The sampling technique used was *non-probability sampling* with a *purposive sampling* method, resulting in 20 respondents who met the inclusion criteria. The inclusion criteria were elderly individuals aged ≥60 years, experiencing poor sleep quality based on PSQI scores (>5), able to communicate effectively, willing to participate and complete the entire intervention protocol, and not diagnosed with dementia. The exclusion criteria included elderly individuals with severe cognitive impairment, those currently using sleep medications or sedatives, and those with acute medical conditions or severe pain that could affect sleep quality.

The instrument used to measure sleep quality was the Pittsburgh Sleep Quality Index (PSQI), which consists of seven components with a total score ranging from 0 to 21. A score of ≤5 indicates good sleep quality, while a score of >5 indicates poor sleep quality. The intervention, consisting of a combination of progressive muscle relaxation and foot massage, was administered directly by the researcher, who is a final-year nursing student and has obtained certification in foot massage therapy. The intervention protocol began with progressive muscle relaxation using

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deep breathing techniques accompanied by systematic muscle contraction and relaxation for 10 minutes, followed immediately by foot massage using gentle massage techniques on both feet for 20 minutes. The intervention was delivered once daily, with a total duration of 30 minutes per session, for seven consecutive days.

Sleep quality was assessed twice using the PSQI questionnaire, namely before the intervention (*pretest*) and after the intervention (*post-test*). Measurements were conducted daily to observe changes and improvements in sleep quality throughout the intervention period. Data analysis began with a normality test using the Shapiro–Wilk test. As the data were not normally distributed, differences in sleep quality before and after the intervention were analysed using the Wilcoxon signed-rank test with a significance level of $\alpha = 0.05$.

This study received ethical approval from the Health Polytechnic of the Ministry of Health Malang (Poltekkes Kemenkes Malang) with ethical clearance number No. DP.04.03/F.XXI.30/0089/2025. All respondents were provided with information regarding the study objectives, procedures, and potential benefits, and written informed consent was obtained prior to data collection.

Results

1. Respondent Characteristics

Table 1. Distribution of Respondent Characteristics at Al-Ishlah Nursing Home, Malang City, February 24 – March 3, 2025

Characteristics	Frequency	Percentage
Gender		
Female	20	100%
Age		
60-74 years *(Eldery age old)*	11	55%
75-90 years *(Old)*	9	45%

Based on the data in Table 1, the distribution of the elderly by gender showed that all respondents were female, totalling 20 elderly (100%). The distribution of the elderly by age indicated that 11 respondents (55%) were aged 60–74 years, while 9 respondents (45%) were aged 75–90 years.

2. Respondent Characteristics Before and After Progressive Muscle Relaxation and Foot Massage Therapy

Table 2. Distribution of Sleep Quality among the Elderly Before and After the Combination Therapy at Al-Ishlah Nursing Home, Malang City, February 24 – March 3, 2025

Notes	Mean ± SD Score PSQI	Category Sleep Quality	N	Z (Wilcoxon)	P (value)
Pretest	9,15 **± 0,000**	>5 (Poor Sleep Quality)	20	-3.930	0,000
Posttest	4,05 **± 0,000**	<5 (Good Sleep Quality)	20		

Table 2 shows that before the intervention, all respondents (N = 20) had poor sleep quality (PSQI > 5) with a mean PSQI score of 9.15. After receiving a combined intervention of progressive muscle relaxation and foot massage, all respondents showed improvement in sleep quality (PSQI < 5), falling into the good category, with a mean score of 4.05. The Wilcoxon test revealed a significant difference between pre- and post-intervention scores, with Z = −3.930 and p = 0.000, indicating that the combined therapy had a significant effect on improving sleep quality in the elderly.

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3. Overview of Each PSQI Domain Before and After Progressive Muscle Relaxation and Foot Massage Therapy

Table 3. Distribution of Each Domain Before and After the Combination Therapy at Al-Ishlah Nursing Home, Malang City, February 24 – March 3, 2025

Domain	Sleep Quality		
	Pre-Test Mean	Post-Test Mean	Mean Change
Subjective Sleep Quality	1,60	0,10	-1,50
Sleep Latency	2,55	0,60	-1,95
Sleep Duration	1,30	0,30	-1,00
Sleep Efficiency	0,55	0,05	-0,50
Sleep Disturbances	1.10	0,85	-0,25
Use of Sleeping Medication	0,00	0,00	0,00
Daytime Dysfunction	2,05	1,05	-1,00

Notes:

- Each PSQI domain has a score range of 0–3.
- Lower scores indicate better sleep quality.
- Negative Δ values indicate improvement in sleep quality after the intervention.

Table 3 shows that all PSQI domains experienced a decrease in scores after the intervention, indicating an improvement in sleep quality among the elderly. The largest mean changes were observed in the sleep latency and subjective sleep quality domains, suggesting that respondents fell asleep faster and perceived their sleep quality as better after the therapy. The daytime dysfunction and sleep duration domains also showed significant improvements, while no change was observed in the use of sleep medication domain, as respondents did not use any sleep medication during the study.

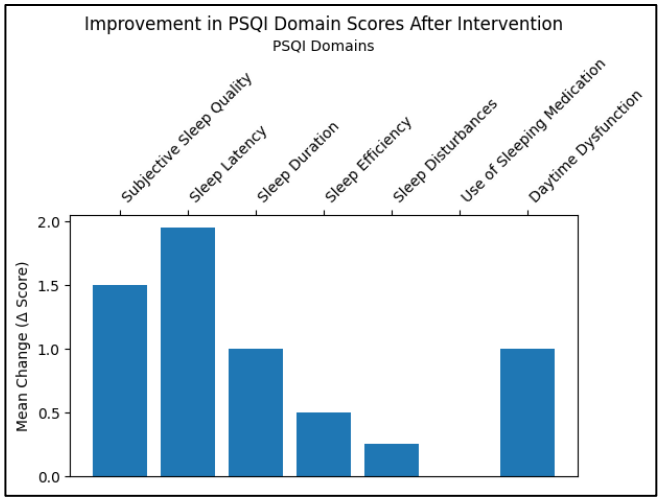

Figure 1 Mean Changes in Each PSQI Domain Before and After Intervention

The bar chart illustrates the magnitude of score changes in each PSQI domain after the combined intervention of progressive muscle relaxation and foot massage. Taller bars indicate greater improvements in sleep quality. The largest improvements were observed in the sleep latency and subjective sleep quality domains, while no change was noted in the use of sleep medication domain.

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4. Overview of Sleep Quality During 7 Days of Progressive Muscle Relaxation and Foot Massage Therapy

Table 4. Overview of Elderly Sleep Quality Over 7 Days at Al-Ishlah Nursing Home, Malang City, February 24 – March 3, 2025

Day of Treatment	N	Mean
Pre-Test	20	9,15
Day 1	20	8,95
Day 2	20	8.35
Day 3	20	7,50
Day 4	20	6.50
Day 5	20	4,95
Day 6	20	4,40
Day 7	20	4,05

Based on Table 4, the greatest decrease in scores was observed on Day 5, with a mean value of 1.55. This finding indicates that the elderly experienced the most significant improvement in sleep quality on Day 5.

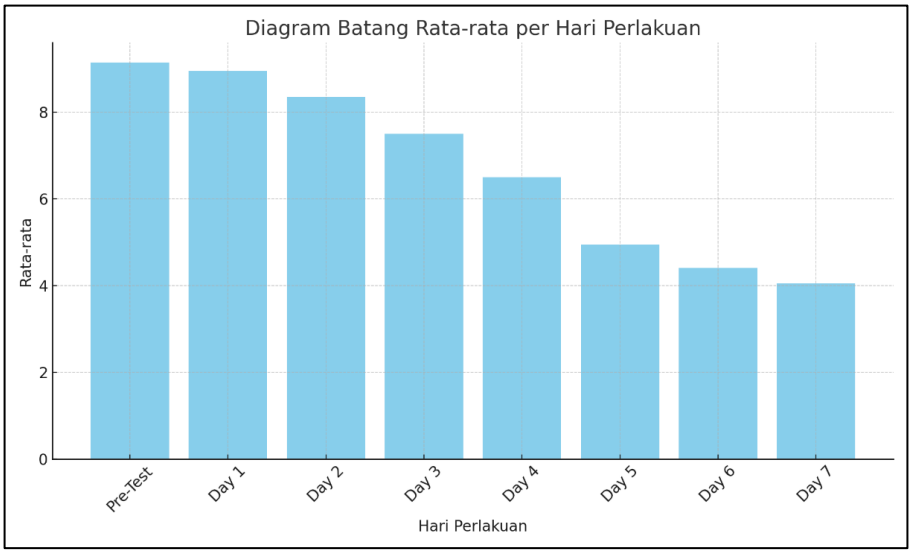

Figure 2 Mean PSQI score across 7 days

Discussion

1. Sleep Quality of the Elderly Before the Combination of Progressive Muscle Relaxation and Foot Massage

The poor sleep quality among the elderly in this study was influenced by several factors, including gender, age, and daily activities. The data showed that all respondents were female, totalling 20 (100%). According to Mustofa et al. (2022), gender affects a person's sleep quality. Women tend to have poorer sleep quality due to a decline in progesterone and esterogen levels, which have receptors in the hypothalamus and play a direct role in circadian rhythm and sleep patterns. Psychologically, increased anxiety, restlessness, and uncontrolled emotions in women caused by decreased esterogen levels can lead to sleep disturbances.

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From the distribution of respondents based on age, 11 elderly individuals (55%) were aged 60–74 years, while 9 individuals (45%) were aged 75–90 years. This finding is consistent with the theory that sleep changes affecting sleep quality are associated with the aging process, such as increased sleep latency, decreased sleep efficiency, early awakening, reduced deep sleep stages, difficulty falling and staying asleep, nightmares, and a shorter duration of deep sleep (Nurdina et al., 2023). Prasetyo et al. (2020) also explained that normal sleep patterns begin to change with increasing age, due to a reduction in neurons that influence sleep waves or central nervous system deficits that decrease responses to external stimuli, disrupt circadian rhythm, and reduce melatonin secretion. The older the elderly, the greater the decline in brain cell function, which leads to reduced neural activity and affects the stimulation of sleep. Physiologically, this contributes to the decrease in both the quality and quantity of sleep among the elderly.

Furthermore, none of the elderly respondents were employed; instead, they followed structured daily routines at Al-Ishlah Nursing Home. In the morning, they participated in organized activities, while in the afternoon and evening they had free time, which was often used for sleeping. This aligns with the literature suggesting that prolonged daytime sleep can interfere with sleep latency and cause frequent awakenings at night. Consequently, excessive daytime sleep may affect nighttime sleep quality and disrupt daily activities (Ariana et al., 2020).

2. Sleep Quality of the Elderly After the Combination of Progressive Muscle Relaxation and Foot Massage

The results of this study showed that after the combination of progressive muscle relaxation and foot massage therapy, all 20 respondents (100%) achieved good sleep quality, The stimulation of nerve points during foot massage generates bioelectric impulses that improve blood and fluid circulation, delivering nutrients and oxygen to body cells. This process produces a relaxation effect involving the Reticular Activating System (RAS) and Gamma-Aminobutyric Acid (GABA). Foot massage increases the release of GABA, which plays a key role in promoting relaxation and sleep. Within the nervous system, GABA reduces neural excitability throughout the body, effectively calming brain activity to facilitate sleep and exerting a hypnotic effect that induces drowsiness and promotes the onset of NREM Stage 1 sleep (Hepsomali et al., 2020). Meanwhile, RAS neurons in the upper brainstem are regulated by another brainstem area known as the Bulbar Synchronizing Region (BSR). The BSR releases serotonin, which induces drowsiness and contributes to improved sleep quality (Edy Prananto et al., 2022).

Progressive muscle relaxation, on the other hand, stimulates the limbic system to produce corticotropin-releasing factor (CRF), which subsequently activates the pituitary gland to release endorphins and pro-opioid melanocortin. This process increases the production of enkephalins by the adrenal medulla, which can positively influence mood. Elevated endorphin and serotonin levels in the brain enhance physical relaxation, while endorphins also inhibit cortisol secretion, resulting in psychological and physical relaxation. Furthermore, the increase in endorphins promotes vasodilation through reduced sympathetic nervous activity, which improves blood and lymphatic circulation and enhances oxygen and energy supply to body tissues. This process facilitates the removal of metabolic waste products and ultimately improves sleep quality among patients (Nurdina et al., 2023).

3. **The Effect of the Combination of Progressive Muscle Relaxation and Foot Massage on Improving Sleep Quality in the Elderly**

This study demonstrated that the combination of progressive muscle relaxation and foot massage resulted in a significant reduction in sleep quality scores, as both interventions have

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relaxing effects. This finding is consistent with Rohmatin (2021) who reported that foot massage improves blood circulation, reduces muscle tension, and stimulates the release of neurotransmitters such as serotonin and endorphins, which contribute to feelings of comfort and relaxation. In addition, Azmi et al. (2021) stated that progressive muscle relaxation systematically reduces muscle tension, thereby creating a calm condition necessary for sleep. Based on these findings, the combination therapy has been proven to significantly improve sleep quality in the elderly.

During the seven-day intervention, the sharpest decrease in scores was observed on the fifth day with an average of 1.55, indicating a significant improvement in sleep quality on that day. This result is in line with Supardi et al. (2022), who found that after five days of progressive muscle relaxation therapy, sleep quality among the elderly improved, with the average score decreasing from 9.15 to 5.05. This effect was attributed to the cumulative impact of the intervention, which enhanced relaxation, reduced stress, and improved sleep quality. Similarly, Nathalia B. Becker et al. (2021) emphasized that structured and continuous intervention programs can provide a significant positive impact on elderly sleep quality, especially when implemented consistently and tailored to individual needs.

As shown in Table 6, before the combination therapy, the domains of subjective sleep quality (1.60), sleep latency (2.55), and daytime dysfunction (2.05) were the most common problems experienced by the elderly at Al-Ishlah Nursing Home Malang.In the domain of subjective sleep quality, sleep quality was assessed based on the feeling of discomfort and anxiety that influence sleep perception (Manoppo et al., 2023). Respondents reported poor sleep quality because they were unable to tolerate changes in sleep patterns due to the aging process. This finding is consistent with Ariana et al. (2020), who explained that the level of tolerance to sleep changes varies among elderly groups. A negative perception of their sleep contributed to the decline in sleep quality.

Meanwhile, in the domain of sleep latency, defined as the time required to fall asleep after lying in bed, many elderly participants experienced prolonged latency. This condition is often associated with medical problems or mood disorders (Ariana et al., 2020). According to Nathalia B. Becker et al. (2021) increased sleep latency can be caused by several factors, such as stress, anxiety, and psychological disorders like depression. The activation of the nervous system due to stress also keeps the brain active, making it difficult for the elderly to fall asleep.

Daytime dysfunction is a condition in which individuals experience difficulty performing daily activities optimally due to lack of sleep or poor-quality sleep. Poor sleep quality, such as insufficient duration or frequent awakenings during the night, can lead to daytime fatigue and significant cognitive impairment. After the combination therapy, almost all domains in the PSQI questionnaire showed improvement.

This study has several limitations that should be considered. First, the absence of a control group limits the ability to compare the effects of the intervention with no treatment or with other therapeutic approaches. Second, the relatively small sample size may affect the generalizability of the study findings. Third, the short intervention period does not allow for an assessment of the long-term effects of the combination of progressive muscle relaxation and foot massage on sleep quality among the elderly.

The authors argue that the combination of progressive muscle relaxation and foot massage has proven effective in improving sleep quality among the elderly. This effectiveness was evident not only from the statistical analysis results but also from the responses of the elderly, who demonstrated positive physiological and psychological changes, such as increased relaxation, comfort, and the ability to fall asleep faster and more soundly without reliance on sleeping medication.

The findings of this study have practical implications for gerontological nursing. The combination of progressive muscle relaxation and foot massage can be recommended as a safe,

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easy-to-implement, and cost-effective nonpharmacological nursing intervention to improve sleep quality among the elderly, particularly in nursing homes or long-term care settings. Nurses are encouraged to integrate this intervention into routine care programs as part of sleep disturbance management.

Conclusion

1. The sleep quality of the elderly respondents at Al-Ishlah Nursing Home, Malang City, before the combined therapy of progressive muscle relaxation and foot massage showed that all respondents experienced poor sleep quality, particularly in the domains of sleep latency, daytime dysfunction, and subjective sleep quality, which were the most problematic.
2. After receiving the combined therapy, all respondents experienced good sleep quality, with almost all domains in the PSQI questionnaire showing improvement.
3. The combined progressive muscle relaxation and foot massage therapy showed a statistically significant improvement in sleep quality among the elderly at Al-Ishlah Nursing Home. The therapy was administered for seven consecutive days, with the most notable improvement observed on Day 5, indicating a marked enhancement in sleep quality. Practically, the combination of progressive muscle relaxation and foot massage has the potential to be integrated into gerontological nursing care routines as a safe, easy-to-implement, and cost-effective nonpharmacological nursing intervention, particularly for the management of sleep disturbances among the elderly in nursing homes or long-term care facilities.

Ethics approval and consent to participate

This study was reviewed and approved by the Health Research Ethics Committee of Politeknik Kesehatan Kemenkes Malang with approval number No.DP.04.03/F.XXI.30/0089/2025. All participants were provided with detailed information regarding the objectives, procedures, potential risks, and benefits of the study. Written informed consent was obtained from all participants before data collection.

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