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Effect of Warm Foot Bath on Sleep Quality and Comfort Level of the Elderly: Randomized Controlled Study

Hanife Durgun,[1] Hatice Kaya[2]

[1]Depermant of Medical Nursing, Ordu University Faculty of Health Sciences, Ordu, Türkiye
[2]Department of Health Sciences, İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine, İstanbul, Türkiye

ABSTRACT

Objective: This study was conducted to evaluate the effect of a warm foot bath on sleep quality and comfort levels in elderly individuals with sleep problems.

Materials and Methods: A randomized controlled trial was conducted between December 2016 and May 2017 with 60 individuals who met the inclusion criteria. Data were collected using the Individual Information Form, the Pittsburgh Sleep Quality Index (PSQI), the General Comfort Questionnaire, and the Numerical Rating Scale. Individuals in the experimental group received a warm foot bath one hour before bedtime for six weeks, while those in the control group did not receive any intervention. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) Statistics software.

Results: The mean post-test scores for subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, and sleep disturbance subcomponents of the PSQI, as well as the total post-test scores of the PSQI in the experimental group, were statistically significantly higher than those in the control group (p=0.001). Additionally, the post-test mean scores of individuals in the experimental group in the physical comfort dimension and relief level of the General Comfort Questionnaire were statistically significantly higher than those in the control group (p=0.006 and p=0.019, respectively).

Conclusion: A warm foot bath is an effective non-pharmacological nursing intervention for improving sleep quality and enhancing the physical comfort and relief levels in elderly individuals with sleep problems.

Keywords: Comfort, elderly, foot bath, sleep quality.

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Address for correspondence:
Hanife Durgun.
Depermant of Medical Nursing, Ordu University Faculty of Health Sciences, Ordu, Türkiye
Phone: +90 452 226 52 00 -6427
E-mail: hanife.balik@gmail.com

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INTRODUCTION

The global age pyramid is shifting, leading to a rapid increase in the percentage of elderly individuals.[1] As people age, they tend to sleep later, experience a reduction in time spent in crucial rapid eye movement (REM) sleep, and have a decreased total sleep duration and quality, leading to sleep-related problems.[2,3] The National Sleep Foundation recommends 7–8 hours of sleep per day for elderly individuals. However, many elderly individuals report sleeping less than the recommended duration and experiencing difficulty with sleep latency.[3–5]

Sleeping is a fundamental process that affects individuals' daily lives as well as their quality of life. It is essential for meeting basic daily needs and encompasses physiological, psychological, environmental, and sociocultural dimensions.[6] Sleep quality, which has gained increasing attention in recent years, is defined as waking up feeling physically fit, refreshed, and ready for a new day. Sleep quality consists of several quantitative aspects and measurements, such as the time taken to fall asleep (sleep latency), total sleep duration, and the number of nighttime awakenings, as well as subjective aspects, such as sleep depth and the restorative nature of sleep.[7]

Such sleep-related problems may negatively impact an individual's comfort. Comfort is a fundamental need and a cornerstone of holistic nursing care practice.[8] Accordingly, addressing sleep-related problems, improving sleep quality, and ensuring comfort for affected individuals require comprehensive nursing care. Pharmacological methods are the most commonly used approach to managing sleep-related problems. However, these methods are often insufficient, as they do not provide a complete solution for sleep-related problems. Additionally, their numerous side effects have led to the development of non-pharmacological treatment methods.9 Relevant literature indicates that interventions such as eye masks, music therapy, massage, alternative and complementary therapies, aromatherapy, and warm foot baths have been successfully used to address sleep-related problems among elderly individuals, thereby enhancing their sleep quality and comfort.[9,10]

A warm foot bath induces peripheral vasodilation and reduces core body temperatures. A negative relationship has been found between core body temperature and the inclination to sleep. As core body temperature decreases, sleep latency shortens, leading to improved sleep quality and comfort levels. As a non-pharmacological method, a warm foot bath is a more practical and cost-effective approach compared to other methods.[11,12]

The relevant literature indicates that studies examining sleep quality and comfort among elderly individuals are limited.[13] Some studies have investigated the effects of relaxation exercises, back massage, aromatherapy, and music therapy on improving sleep quality and comfort.[14] However, research specifically examining the impact of warm foot baths on sleep quality is limited.[11–13,15–17]

Aim of the Study

This study aimed to investigate the effect of a warm foot bath on sleep quality and comfort in elderly individuals with sleep problems.

KEY MESSAGES

- Sleep is essential to meet the basic needs of daily life.
- The change in the PSQI score for participants in the experimental group showed a significant improvement in sleep quality compared to the control group.
- The change in the GCQ score for participants in the experimental group showed a significant improvement in comfort level compared to the control group.

Hypotheses

The hypotheses of this study are as follows:

H1: A warm foot bath improves sleep quality in elderly individuals.

H2: A warm foot bath increases the comfort level of elderly individuals.

MATERIALS AND METHODS

Study Design

This study was a randomized controlled trial. It was registered with ClinicalTrials under the registration number NCT04413188 on January 6, 2020.

Sample

The study was conducted in two nursing homes in the Marmara Region of Türkiye between December 2016 and May 2017. The sample consisted of 60 individuals who met the inclusion criteria and agreed to participate. The sample size was determined based on Cohen's standard effect sizes using the G*Power 3.1. program. Cohen defined effect size as follows: 0.20 (weak effect), 0.50 (medium effect), and 0.80 (large effect). In this context, the effect size was calculated based on 0.80 (large effect size), with a Type I error of 0.05 and a Type II error of 0.10 (90% power). A minimum of 28 participants per group was required; however, considering potential data loss, the study was planned with 30 participants per group, totaling 60 participants, to account for an additional 10%. The Consolidated Standards of Reporting Trials diagram is shown in Figure 1.

The eligibility criteria for participants in the study were as follows: individuals aged 65 years or older, relatively independent in daily life activities, literate, with a Pittsburgh Sleep Quality Index (PSQI) score of 5 or higher, and no communication problems. Exclusion criteria included the use of sleeping medications or diuretics and the presence of peripheral artery disease or neurological conditions such as dementia or Alzheimer's disease.

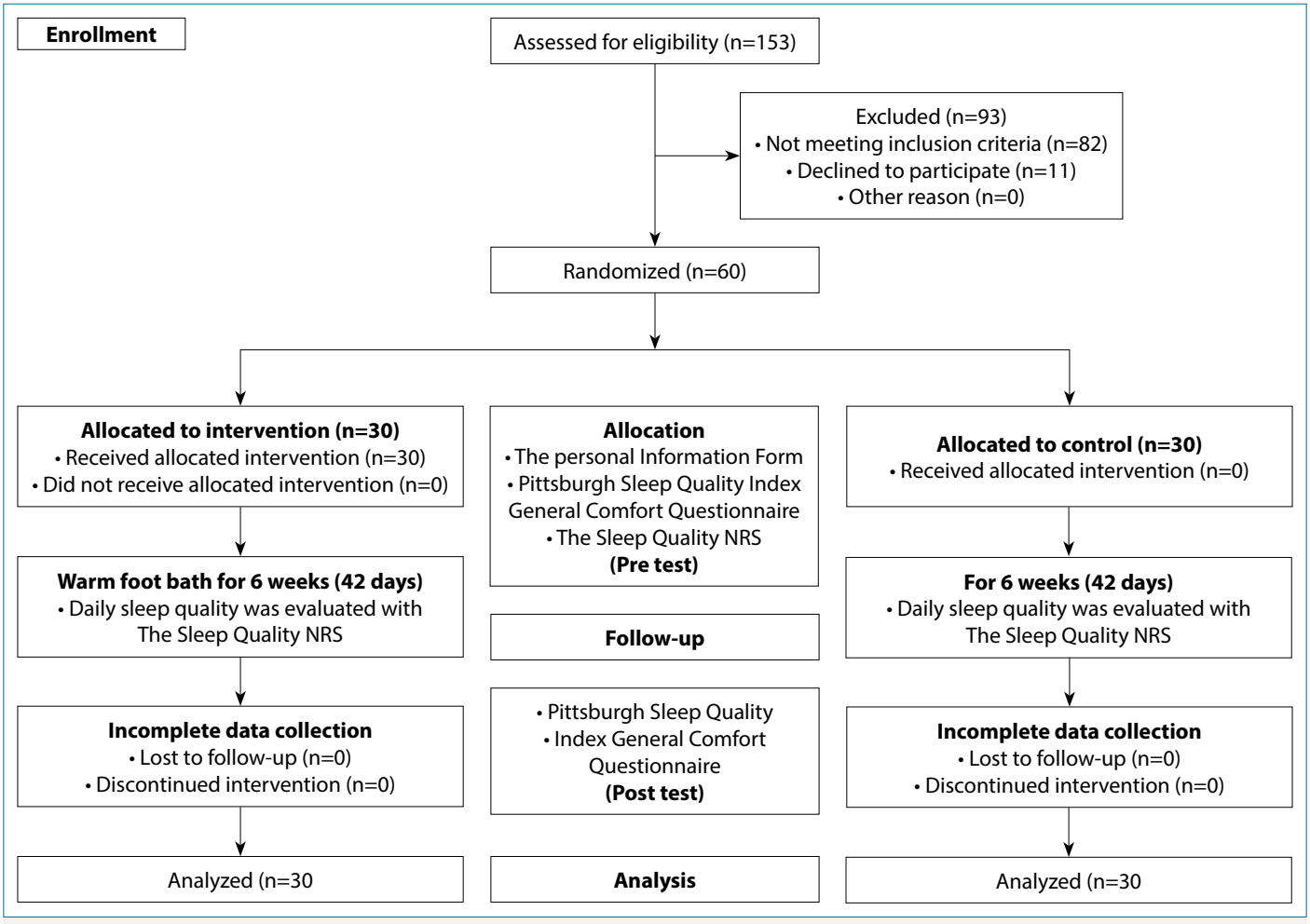

Figure 1. Consolidated Standards of Reporting Trials (CONSORT) flowchart of intervention and control groups.

Data Collection Tools

Data were collected using a Personal Information Form, the Pittsburgh Sleep Quality Index, the General Comfort Questionnaire (GCQ), and the Numerical Rating Scale (NRS).

Individual Information Form

This form was developed based on relevant literature to assess the sociodemographic characteristics and sleep habits of elderly individuals. It included five questions related to age, gender, marital status, education level, and income status.[16–19]

Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index was developed by Buysse et al.[20] to evaluate individuals' sleep quality and sleep disorders over a one-month period. The validity and reliability study of the scale in the Turkish population was conducted by Ağargün et al.[21] The scale consists of 24 items, with 19 self-reported items answered by the participants. These 19 questions reflect seven major components of sleep quality. The last five items of the index (11a, 11b, 11c, 11d, and 11e) are answered by the participants' partners or roommates and are not included in the scoring. Each item is scored on a scale from 0 to 3, where 0 indicates good sleep quality and 3 indicates poor sleep quality. Accordingly, higher total scores indicate poorer sleep quality. A total score of 0-4 indicates good sleep quality, while a score of 5–21 suggests poor sleep quality.[20]

General Comfort Questionnaire

The General Comfort Questionnaire was developed by Katharine Kolcaba[8] in 1991 to assess individuals' comfort needs and evaluate nursing interventions aimed at enhancing comfort. The GCQ questionnaire consists of 48 items and is scored using a four-point Likert scale. The total score obtained from the scale is divided by 48 (the total number of the items) to determine the mean score, which ranges from 1 to 4.[21]

The GCQ was adapted for use in the Turkish population by Kuguoğlu and Karabacak in 2004. The Cronbach's alpha coefficient of the original scale was 0.88, while in the study conducted by Kuguoglu and Karabacak, it was 0.85. In the present study, Cronbach's alpha coefficient was 0.68 before the experiment and 0.75 after the experiment.[22,23]

Numerical Rating Scale

The Numerical Rating Scale was developed as a form incorporating a scale, allowing individuals to assess and record their personal sleep quality each day. The NRS asks patients to select a number from 0 to 10 that best represents their sleep, with 0 indicating a poor night's sleep and 10 indicating a good night's sleep.

Randomization

A total of 153 potential participants were assessed, and 71 were deemed eligible. The study was conducted with 60 participants, including 30 in the warm foot bath group and 30 in the control group. Ninety-three elderly individuals deemed ineligible for the study due to the use of sleep drugs (n=37), use of diuretic drugs (n=35), presence of peripheral artery disease (n=5), PSQI scores below 5 (n=5), or lack of willingness to participate (n=11). A total of 60 participants completed the trial, and their data were available for outcome analysis. Each participant was assigned a number, and the researcher informed eligible individuals about the study, obtaining their written informed consent. Participants were randomly assigned to the experimental and control groups using a computer-generated randomization table. The research protocol was conducted in accordance with the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT).[24] and was reported following the Consolidated Standards of Reporting Trials (CONSORT) guidelines (Fig. 1).[25]

Data Collection and Intervention

Pretests were administered to individuals in both groups. Participants were instructed on how to use the NRS, and this process was explained to each individual one-on-one.

Warm Foot Bath Group

Participants in the experimental group were instructed to soak their feet in warm water (38–40°C) for 20 minutes, one hour before bedtime, every day for six weeks.[13,16,17] A Beurer FB50 luxury foot bath spa with a water heater was used for this purpose. The foot bath has a depth of 10 cm, maintains a constant water temperature of 35–48°C for 15–60 minutes, features a display screen for water temperature and duration of use, and automatically shuts off (Fig. 2).

A total of five foot baths was used in this study. After the intervention was completed with five participants for six weeks, a new group was formed. To ensure hygiene, the foot bath pedicure machine was covered with overshoes, and tap water was added to a depth of 10 cm before participants placed their feet in the bath. The water temperature was then adjusted to 38–40°C. Once the required water temperature was reached, the device's timer was set for 20 minutes, ensuring the water temperature remained between 38°C and 40°C. After the session, participants' feet were dried using paper towels.

Figure 2. Warm foot bath application (image created with DALL-E 3 program).

The NRS was used to assess participants' sleep quality and was administered daily. Participants were asked to mark the form each morning, and those who did not complete it in the morning were reminded to do so in the evening. The completed NRS forms were collected every day. Additionally, the PSQI and the GCQ were administered again at the end of the sixth week.

Control Group

Data from participants in the control group were collected using the same procedure as in the experimental group. The Personal Information Questionnaire, PSQI, and GCQ were administered in the control group before the study. The NRS was administered daily, with participants asked to mark the form each morning. Those who did not complete it in the morning were reminded in the evening. The completed NRS forms were collected daily. At the end of the sixth week, the PSQI and GCQ were administered again.

Table 1. Individuals' sociodemographic characteristics (n=60)

Personal characteristics	Warm foot bath group (n=30) Mean±SD	Control group (n=30) Mean±SD	t	p
Age	73.47±6.03	74.33±7.23	-0.504	0.616
	n (%)	n (%)	χ^2	p
Sex			0.067	0.796
Female	15 (50)	13 (43.3)		
Male	15 (50)	17 (56.7)		
Marital status			4.320	0.080
Single	22 (73.3)	28 (93.3)		
Married	8 (26.7)	2 (6.7)		
Education level			2.111	0.348
Literate	6 (20)	11 (36.7)		
Primary school	13 (43.3)	11 (36.7)		
Secondary school	5 (16.7)	5 (13.3)		
High school	3 (10.0)	4 (13.3)		
University or higher	3 (10.0)	–		
Income level			0.445	0.505
Below expenses	7 (23.3)	4 (13.3)		
Equal to or above expenses	23 (76.7)	26 (86.7)		
Health insurance coverage			4.800	0.054
Yes	24 (80)	16 (53.3)		
No	6 (20)	14 (46.7)		

t: Student's t-Test; χ^2: Chi-Square Test, Yates Continuity Correction, and Fisher's Exact Chi-Square Test. $p<0.05$; SD: Standard deviation.

Statistical Analysis

To ensure unbiased reporting, the data were analyzed by an expert statistician. Statistical analyses were conducted using IBM SPSS Statistics Version 22.0 (Armonk, NY: IBM Corp.). for Windows. The normality of the data distribution was assessed using the Kolmogorov-Smirnov test. Descriptive statistics, including arithmetic means, standard deviations, and frequencies, were calculated. Group similarities were evaluated using the Student's t-test, Chi-Square test, and Mann-Whitney U test. Differences between study groups were analyzed using the independent-sample t-test and Mann-Whitney U test, while Wilcoxon signed-rank test and paired sample t-test were used for within-group comparisons. Comparisons of sleep quality and comfort levels were conducted using the Pittsburgh Sleep Quality Index and the General Comfort Questionnaire at baseline (week 0) and after six weeks. A p-value of less than 0.05 was considered statistically significant.

Ethical Consideration

Ethical approval was obtained from the İstanbul University Clinical Research Ethics Committee on November 1, 2016, under decision number A/10. Permission was also obtained from the Ministry of Family and Social Policies, which oversees the institutions where the study was conducted. Participants were fully informed about the study's objectives, and written informed consent was obtained from all consenting individuals. The study was conducted in full compliance with the Declaration of Helsinki guidelines.

RESULTS

The demographic characteristics of the participants are presented in Table 1. There was no difference between the demographic characteristics of individuals in the experimental and control groups ($p>0.05$).

Table 2. Pittsburgh Sleep Quality Index scores of individuals in the warm foot bath and control groups

Sub-dimensions	Pre-test Median (Min–Max) - Mean±SD	Post-test Median (Min–Max) - Mean±SD	[2]Z	p
Subjective sleep quality				
Warm foot bath group	2 (2–3) - 2.23 (0.43)	1 (0–3) - 1.10 (0.54)	-4.713	0.001**
Control group	2 (0–3) - 2.26 (0.63)	2 (2–3) - 2.16 (0.37)	-0.905	0.366
Test	[1]Z=0.622	[1]Z=-6.390		
p	p=0.534	p=0.001**		
Sleep latency				
Warm foot bath group	3 (2–3) - 2.76 (0.43)	2 (1–2) - 1.76 (0.43)	-4.860	0.001**
Control group	3 (2–3) - 2.56 (0.50)	2 (1–2) - 1.53 (0.50)	-2.000	0.046*
Test	[1]Z=-1.818	[1]Z=-6.561		
p	p=0.069	p=0.001**		
Sleep duration				
Warm foot bath group	6 (3–6) - 6.14 (1.10)	8 (1–9) - 7.18 (1.61)	-3.105	0.002**
Control group	5 (3–7) - 5.30 (1.05)	5 (4–7) - 5.33 (0.88)	-2.309	0.021*
Test	[1]Z=-2.548	[1]Z=-4.955		
p	p=0.011*	p=0.001**		
Normal sleep activity				
Warm foot bath group	1.50 (0–3) - 1.46 (0.68)	0 (0–3) - 0.40 (0.77)	-3.746	0.001**
Control group	2 (0–3) - 1.76 (0.72)	1 (0–3) - 1.46 (0.93)	-1.155	0.248
Test	[1]Z=1.612	[1]Z=-4.764		
p	p=0.107	p=0.001**		
Sleep disorder				
Warm foot bath group	1.5 (1–2) - 1.50 (0.50)	1 (1–2) - 1.06 (0.25)	-4.243	0.001**
Control group	1 (1–2) - 1.23 (0.43)	1 (1–2) - 1.06 (0.25)	-0.707	0.480
Test	[1]Z=-1.412	[1]Z=-2.895		
p	p=0.158	p=0.004**		
PSQI total				
Warm foot bath group	14 (12–18) - 14.14 (1.41)	12 (7–16) - 11.51 (1.55)	-4.751	0.001**
Control group	13 (11–15) - 13.13 (1.00)	11 (10–14) - 11.56 (1.04)	-0.964	0.335
Test	[1]Z=-3.016	[1]Z=-6.506		
p	p=0.003**	p=0.001**		

[1]Z: Mann-Whitney U Test; [2]Z: Wilcoxon Signed Rank Test; *: P<0.05; **: P<0.001. PSQI: Pittsburgh Sleep Quality Index; Min: Minimum; Max: Maximum; SD: Standard deviation.

Table 2 presents the overall PSQI and sub-dimension scores for both the experimental and control groups. No statistically significant difference was found between the mean pretest scores for subjective sleep quality, sleep latency, normal sleep activity, and sleep disorder in the two groups (p>0.05). However, the mean pretest sleep duration score of the control group was statistically significantly higher than that of the experimental group (p=0.011).

The mean post-test subjective sleep quality score in the control group was statistically significantly higher than that of the experimental group (p=0.001). Additionally, a statistically significant difference was found between the pretest and post-test scores of individuals in the experimental group (p=0.001). The mean sleep latency score in the control group was statistically significantly higher than that of the experimental group (p=0.001). Similarly, the mean

Table 3. General Comfort Questionnaire scores of individuals in the warm foot bath and control groups

	Pre-test, Mean±SD	Post-test, Mean±SD	²t	p
Comfort dimensions				
Physical comfort				
Warm foot bath group	3.00±0.35	3.24±0.33	-9.898	0.001**
Control group	3.02±0.37	2.99±0.36	1.133	0.266
Test	¹t=-0.248	¹t=2.839		
p	p=0.805	p=0.006**		
Psychospiritual comfort				
Warm foot bath group	3.35±0.42	3.31±0.41	1.275	0.212
Control group	3.24±0.40	3.23±0.39	0.598	0.555
Test	¹t=0.989	¹t=0.740		
p	p=0.327	p=0.462		
Environmental comfort				
Warm foot bath group	2.97±0.36	3.00±0.36	-1.170	0.252
Control group	2.95±0.33	2.93±0.34	1.237	0.226
Test	¹t=0.261	¹t=0.683		
p	p=0.795	p=0.497		
Sociocultural comfort				
Warm foot bath group	2.73±0.27	2.74±0.28	-0.571	0.573
Control group	2.74±0.35	2.73±0.33	0.619	0.541
Test	¹t=-0.208	¹t=0.042		
p	p=0.836	p=0.966		
Comfort levels				
Relief				
Warm foot bath group	3.00±0.35	3.20±0.35	-10.051	0.001**
Control group	3.01±0.34	2.99±0.32	1.021	0.316
Test	¹t=-0.123	¹t=2.424		
p	p=0.903	p=0.019*		
Relaxation				
Warm foot bath group	3.18±0.34	3.14±0.322	1.327	0.195
Control group	3.16±0.32	3.14±0.32	1.142	0.263
Test	¹t=0.308	¹t=0.085		
p	p=0.759	p=0.933		
Overcoming problems				
Warm foot bath group	2.89±0.28	2.91±0.30	-1.253	0.220
Control group	2.83±0.31	2.82±0.31	1.053	0.301
Test	¹t=0.811	¹t=1.164		
p	p=0.420	p=0.249		
GCQ total				
Warm foot bath group	3.03±0.28	3.09±0.28	-3.988	0.001**
Control group	3.01±0.25	2.99±0.25	1.356	0.185
Test	¹t=0.359	¹t=1.483		
p	p=0.721	p=0.144		

¹t: Student's t-Test; ²t: Paired Sample t-Test; *: P<0.05; **: P<0.001. GCQ: General Comfort Questionnaire; SD: Standard deviation.

Table 4. Sleep Quality Numerical Rating Scale scores of individuals in the warm foot bath and control groups

Sleep Quality Numerical Rating Scale (NRS)	Warm foot bath group Median (Min–Max) - Mean±SD	Control group Median (Min–Max) - Mean±SD	Z	p
Pre-test (first day)	3 (2–4) - 3.20 (0.66)	4 (2–6) - 3.60 (0.93)	-1.724	0.085
Post-test (42nd day)	8 (7–9) - 8.26 (0.69)	4 (3–6) - 4.13 (0.77)	-6.789	0.001*
Z	-4.825	-3.133		
p	0.001*	0.002*		

Z: Mann-Whitney U Test; *: P<0.001; Min: Minimum; Max: Maximum; SD: Standard deviation.

sleep duration score of participants in the control group was statistically significantly higher than that of the experimental group (p=0.001). Additionally, the mean normal sleep activity score in the control group was statistically significantly higher than that of the experimental group (p=0.001). The mean sleep disorder score in the control group was also statistically significantly higher than that of the experimental group (p=0.004).

Table 3 presents the overall GCQ scores for participants in both groups. No statistically significant difference was found between the pretest comfort dimension scores of the experimental and control groups (p>0.05).

The mean post-test physical comfort dimension score of the experimental group was statistically significantly higher than that of the control group (p=0.006). Additionally, the post-test physical comfort score of the experimental group was statistically significantly higher than its pretest score (p=0.001). There was no statistically significant difference between the post-test psychospiritual, environmental, and sociocultural comfort mean scores of the two groups (p>0.05). However, the mean post-test relief level score of the experimental group was statistically significantly higher than that of the control group (p=0.019), and it was also significantly higher than the mean pretest score of the experimental group (p=0.001). No statistically significant difference was found between the mean scores for relaxation or overcoming problems in both groups.

Table 4 presents the overall NRS scores of participants in the experimental and control groups. There was no statistically significant difference between the groups in terms of mean pre-application NRS scores (p=0.085). However, after the intervention, the mean post-application NRS scores of the experimental group were statistically significantly higher than those of the control group (p=0.001). Additionally, the increase in post-application NRS scores in the experimental group compared to the pre-application scores was statistically significantly higher than in the control group (p=0.001). A statistically significant increase in mean NRS scores was observed in both the experimental and control groups after the intervention compared to pre-intervention scores (p=0.001 and p=0.002, respectively).

DISCUSSION

The results of the study demonstrated that the mean post-test Pittsburgh Sleep Quality Index score in the experimental group was statistically significantly lower compared to the pretest scores within the same group. This finding underscores the efficacy of warm foot baths in improving sleep quality, a conclusion that aligns with existing literature on the subject.[11–13,15,17,19,26,27] In contrast, the control group showed no significant reduction in PSQI scores, indicating that baseline poor sleep quality persisted without intervention.

The analysis further revealed significant improvements in specific PSQI sub-dimensions, including subjective sleep quality, sleep latency, total sleep duration, habitual sleep efficiency, and sleep disturbance in the experimental group. However, no statistically significant differences were observed in these dimensions for the control group, except for sleep latency and sleep duration, where minor variations were noted. These findings corroborate prior studies reporting statistically significant improvements in post-test PSQI scores among individuals in experimental settings receiving warm foot baths.[13,16,17] Collectively, the evidence suggests that warm foot baths serve as an effective non-pharmacological intervention for enhancing sleep quality, particularly among elderly individuals.

In terms of comfort levels, the General Comfort Questionnaire scores of the experimental group increased significantly from pretest to post-test, while no such significant change was observed in the control group. This improvement in the experimental group's scores suggests that warm foot baths contribute to increased comfort levels, likely due to their relaxing and restorative physical effects. Interestingly, although the overall GCQ scores did not differ significantly between the experimental and control groups, the physical comfort

dimension exhibited a statistically significant improvement in the experimental group after the intervention. This outcome highlights the potential of warm foot baths to promote physical relaxation and rest, even if broader measures of comfort remain unaffected.

Notably, the pretest scores for both groups were highest in the "relaxation" dimension, whereas the post-test scores peaked in the "relief" dimension. Although the mean scores for relaxation and overcoming problems did not show statistically significant differences between the two groups, a significant improvement in relief scores was identified within the experimental group. These findings are consistent with similar research, such as studies on music therapy, which also reported enhanced relief scores in elderly patients.[28] The observed improvements in GCQ physical comfort and relief scores could be attributed to the therapeutic effects of warm water immersion, which facilitates physical relaxation and comfort.

Regarding subjective daily sleep quality, as assessed by the Numerical Rating Scale, the experimental group exhibited a statistically significant improvement in post-test scores compared to pretest scores. Furthermore, these improvements were significantly greater than those observed in the control group. This finding contrasts with the study by Liao et al.,[29] who reported no statistically significant differences in NRS scores between experimental and control groups in their study on warm foot baths for elderly individuals with sleep disorders. The disparity may be explained by differences in study design, population characteristics, or intervention protocols.

In summary, the present study underscores the efficacy of warm foot baths as a non-pharmacological intervention for improving sleep quality and physical comfort in elderly individuals. While the intervention demonstrated notable improvements in specific dimensions of comfort and subjective sleep quality, further research is warranted to explore its broader impact on overall well-being.

Limitations

Several limitations of this study should be acknowledged. First, the study was conducted in two nursing homes; therefore, the results may not be generalizable to other nursing home settings. Additionally, the outcome assessor and elderly individuals were not blinded to the intervention, which could have introduced bias in participants' sleep and comfort scores. Moreover, elderly individuals may respond differently to sleep and comfort interventions based on their physical condition, emotional state, and environmental factors.

CONCLUSION

This study aimed to evaluate the effects of warm foot baths on the sleep quality and comfort levels of elderly individuals experiencing sleep disturbances. The findings provide robust evidence supporting the incorporation of warm foot baths as an adjuvant therapeutic intervention in managing sleep problems among this population. As a simple, cost-effective, and non-invasive method, warm foot baths demonstrated significant potential to enhance both sleep quality and comfort levels.

Given their affordability and lack of adverse effects, warm foot baths represent a practical and accessible intervention for addressing sleep disturbances in elderly individuals. These attributes make them particularly well-suited for integration into routine care plans for older adults, offering a sustainable approach to improving overall well-being and quality of life in this demographic.

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Author Contributions: Concept – HD, HK; Design – HD, HK; Supervision – HK; Resource – HD; Materials – HD; Data Collection and/or Processing – HD; Analysis and/or Interpretation – HD, HK; Literature Search – HD; Writing – HD; Critical Reviews – HK.

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