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Review Article

Footbath Therapy in Stroke Rehabilitation: A Systematic Review of Physical and Psychological Outcomes and Implication for Nursing Practice

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Abstract

Stroke remains a major neurological condition that frequently results in long-term functional impairments and reduced quality of life among survivors. In addition to pharmacological therapy, various non-pharmacological interventions have been investigated to support recovery, among which footbath therapy has demonstrated potential benefits for both physical and psychological outcomes. This systematic review aimed to identify and synthesise current scientific evidence regarding the effectiveness of footbath therapy in stroke patients. Following PRISMA guidelines, a comprehensive search was conducted for articles published between 2014 and 2024 in ProQuest, ScienceDirect, Cochrane, EBSCO, PubMed, and Google Scholar, using keywords developed through the PICO framework. A narrative synthesis approach was employed to analyze the findings, with six eligible studies comprising four randomized controlled trials (RCTs) and two quasi-experimental studies. The findings suggest that footbath therapy may enhance parasympathetic nervous system activity, improve muscle strength, and reduce spasticity and physical fatigue. Psychologically, it appears to alleviate anxiety and psycho-emotional stress while promoting comfort and sleep satisfaction. The evidence suggests potential benefits of footbath therapy in stroke patients. Given its low risk and ease of implementation, footbath therapy may be regarded as a promising complementary intervention in stroke patients. However, the evidence is based on a small number of heterogeneous studies, and the overall quality of evidence appears limited, suggesting that the findings should be interpreted with caution. Therefore, high-quality randomized controlled trials are needed to strengthen the evidence.

INTRODUCTION

As a critical global health issue, stroke has been identified as one of the primary contributors to death and long-term disability worldwide [1]. The World Stroke Organization (WSO) Global Stroke Fact Sheet 2022 reports that stroke accounts for

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6.6 million deaths and 143 million disability-adjusted life years (DALYs) globally, with approximately 12.2 million individuals experiencing a new stroke each year. This indicates that one in four individuals over the age of 25 will experience a stroke in their lifetime. Stroke can affect almost every aspect of a survivor's life and result in a significant economic burden. The global cost associated with stroke is projected to rise substantially from US$891 billion per year in 2017 to approximately US$2.31 trillion by 2050 [2]. In Indonesia, stroke accounts for the third-largest healthcare cost with IDR 5.2 trillion spent in 2023, and a prevalence of 8.4 diagnosed stroke cases per 1,000 individuals aged 15 years and older [3].

Stroke occurs when cerebral circulation is disrupted due to vessel obstruction in ischemic stroke or rupture of the vessel in hemorrhagic stroke, leading to brain cell damage, the severity of which depends on the affected area and duration of ischemia. The condition can cause diverse impairments, including sensorimotor deficits, language and vision disturbances, cognitive decline, and bladder dysfunction. According to the World Stroke Organization, around 50 million individuals who have survived a stroke encounter challenges related to physical, cognitive, and emotional functioning [4]. In addition to these visible impairments, invisible symptoms such as fatigue, depression, emotional instability, and anxiety also significantly impact survivors' quality of life [5]. While pharmacological therapies such as anticoagulants, antihypertensive agents, and other medications are crucial for improving the condition of stroke patients and preventing recurrence, they often fail to fully address the multifaceted consequences of stroke. This highlights the importance of non-pharmacological interventions to support physical rehabilitation and improve overall quality of life.

One such intervention is footbath therapy, or immersion of the feet in warm water, which combines heat therapy and hydrotherapy to optimize therapeutic effects. These therapies have been utilized since ancient times; for example, Florence Nightingale documented the use of heat therapy as part of nursing practice. Physiologically, a footbath activates TRPV3 and TRPV4 receptors through thermal and mechanical stimulation [6]. Heat therapy increases local temperature, causing vasodilation of blood vessels, improved circulation, reduced muscle tension, and enhanced relaxation [7,8]. Hydrotherapy on the other hand, uses water to provide gentle pressure on the skin. The warm sensation and gentle pressure stimulate the parasympathetic nervous system through physiological mechanisms involving the autonomic nervous system [9].

Given its simplicity and ease of application, footbath therapy can be initiated based on nurses' clinical judgment without the need for specialized equipment or complex medical interventions. Therefore, it can be applied as a nurse-led, non-pharmacological intervention integrated into routine, comfort-oriented, and supportive nursing care. Footbath has been extensively studied across various populations, showing positive outcomes in pain reduction [10], sleep quality improvement [11], relaxation [9], and blood pressure reduction [12,13]. However, evidence specifically regarding its effects in stroke patients remains limited. To date, no systematic review has synthesized evidence on footbath therapy in stroke recovery. Given that stroke recovery requires holistic management addressing both physical and psychological aspects, supportive nurse-led interventions may complement medical and rehabilitative strategies. Accordingly, this study aims to address this gap by systematically reviewing existing evidence on its physical and psychological effects in stroke patients to clarify its potential role in supporting recovery.

METHOD

This study used a systematic review methodology, which involves collecting literature from various sources containing previous research findings. The research question was formulated using the PICO framework, which includes population, intervention, comparison, and outcome, and is subsequently analyzed to draw a conclusion. Due to substantial heterogeneity in intervention protocols, outcome measures, and study designs among the included studies, a narrative approach was used to synthesize the findings. This approach allows for structured comparison and comprehensive interpretation of the available evidence. The variability in intervention parameters further limits direct comparison across studies and the standardization of practice.

"The literature search was conducted using predefined keywords combined with Boolean operators such as "AND" and "OR." The keywords used are "stroke" OR "cerebrovascular accident" AND "footbath" OR "foot soak" AND "outcome" OR "recovery". Literature searches were conducted across several databases, including ProQuest, ScienceDirect, Cochrane, EBSCO, PubMed, and Google Scholar.

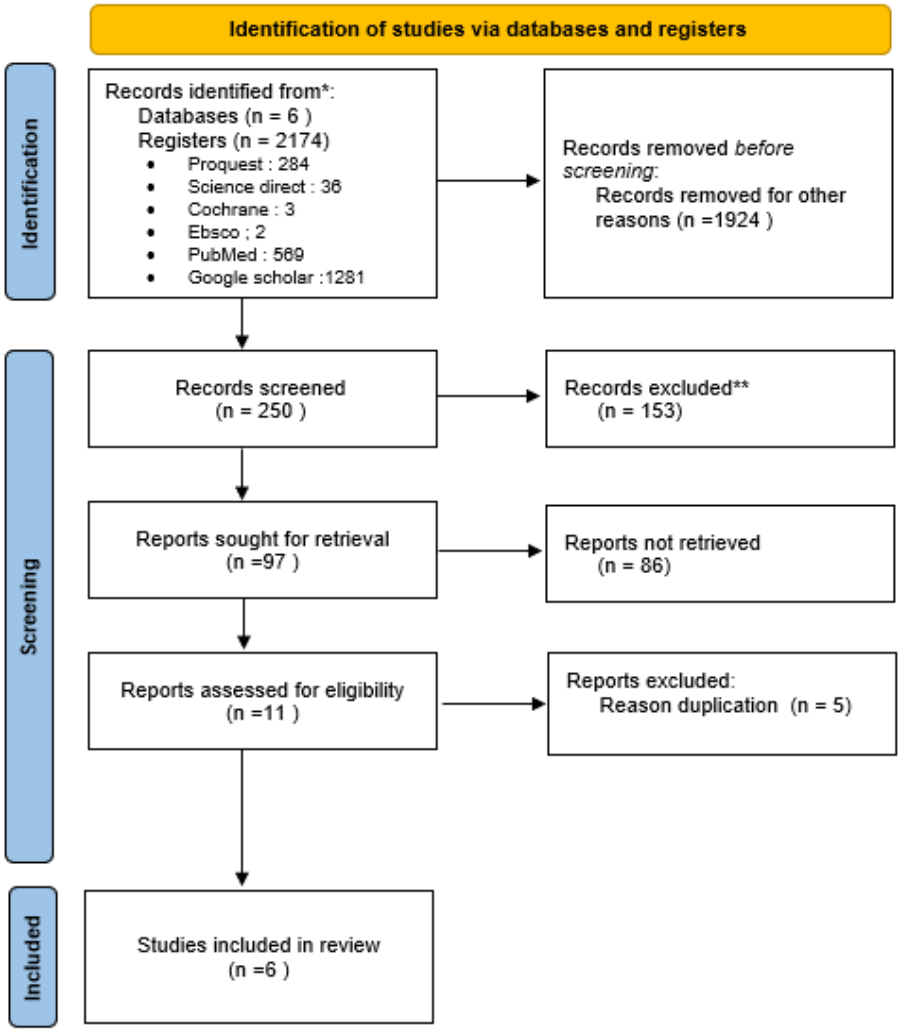

Figure 1.
PRISMA Flowchart

The inclusion criteria for this study studies published between 2014 and 2024, RCT or quasi-experimental studies, and the availability of abstracts and full-text articles. Exclusion criteria included literature reviews, scoping reviews,

umbrella reviews, and systematic reviews. The systematic review was conducted by the first author under the supervision of two academic advisors, who provided feedback on study selection, data synthesis, and interpretation of findings. This review was officially registeres in PROSPERO database (CRD420250638727). The details of the article search strategy are presented in the following PRISMA flowchart.

RESULTS

A litetaure searched conducted in six databases indetified 2,174 articles. A total of 2,168 articles were exluded due to noncompliance the inclusion and exclusion criteria, such as having irrelevant titles and abstracts, not being research studies, or not having accessible full-text versions. After further screening and assessment, 6 articles that met the criteria were analyzed in-depth for inclusion in this review.

Article Characteristics

This review included six studies, four randomized controlled trials (RCTs) and two quasi-experimental studies. All articles were critically appraised with the JBI critical appraisal checklist, with most criteria adequately met. The findings of this review are presented in four tables: Table 1 summarizes the appraisal of RCTs, Table 2 presents the appraisal of quasi-experimental studies, Table 3 outlines the search results and key findings, and Table 4 provides a synthesis of the analyzed studies.

A summary of the critical appraisal isn presented in Table 1, highlighting methodological strengths and limitations while provising on overvies of the overall quality dan rigor of the studies.

Table 1
Summary of RCT Article Critiques

No	The JBI Critical Appraisal Tool for RCTs	Matsumoto et al 2014	Seidi et al 2023	Setiawan, et al 2021	Lee et al 2017
1.	Was true randomization used for assignment of participants to treatment groups?	YES	YES	?	YES
2.	Was allocation to treatment groups concealed?	YES	YES	NO	NO
3.	Were treatment groups similar at the baseline?	YES	YES	YES	NO
4.	Were participants blind to treatment assignment?	?	YES	NO	NO
5.	Were those delivering the treatment blind to treatment assignment?	?	NO	NO	NO
6.	Were treatment groups treated identically other than the intervention of interest?	YES	YES	YES	YES
7.	Were outcome assessors blind to treatment assignment?	YES	NO	NO	NO
8.	Were outcomes measured in the same way for treatment groups?	YES	YES	YES	YES
9.	Were outcomes measured in a reliable way	?	YES	YES	YES
10	Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?	YES	YES	YES	YES
11.	Were participants analysed in the groups to which they were randomized?	YES	YES	?	?
12.	Was appropriate statistical analysis used?	YES	YES	YES	YES
13.	Was the trial design appropriate and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?	YES	YES	YES	YES
	Total Yes	10	11	7	7
	Percentage (%)	77%	85%	54%	54%

Table 1 summarizes the JBI appraisal of four RCTs, with quality scores ranging from 54% to 85%. Two studies showed stronger rigor, while the others had methodological gaps, mainly in allocation concealment, and blinding. Meanwhile, Table 2 provides the results of the JBI Critical Appraisal for quasi-experimental studies, outlining their methodological quality and offering insights into the validity and reliability of these articles.

Table 2
Summary of Quasi-Experimental Article Critiques

No	The JBI Critical Appraisal Tool for Quasi-Experimental Studies	Son & Yoo, 2016	Toki, et al 2015
1.	Is it clear in the study what is the 'cause' and what is the 'effect' (i.e. there is no confusion about which variable comes first)?	YES	YES
2.	Was there a control group?	YES	YES
3.	Were the participants included in any comparisons similar?	YES	YES
4.	Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	?	YES
5.	Were there multiple measurements of the outcome both pre and post the intervention/exposure?	YES	YES
6.	Were the outcomes of participants included in any comparisons measured in the same way?	YES	YES
7.	Were outcomes measured in a reliable way?	?	?
8.	Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	YES	YES
9.	Was appropriate statistical analysis used?	YES	YES
	Total Yes	7	8
	Percentage (%)	78%	89%

Overall, the quasi-experimental evidence reviewed demonstrated acceptable methodological rigor. Both studies showed good methodological quality, although limitations in measurement reliability indicate a potential risk of bias. Table 3 highlights the essential findings of the included studies, showcasing how different interventions were applied and their impact, thereby providing a concise snapshot of the evidence base for this review.

Table 3
Summary of Articles from the Search Results

No	Authors, Year, Objective & Design	Sample & Intervention	Result
1	Anti-Spastic Effects Of Footbaths In Post-Stroke Patients: A Proof-Of-Principle Study. (Matsumoto et al 2014) Objective: To investigate whether footbaths reduce spasticity in the lower limbs of hemiplegic post-stroke patients. Design: Randomized Controlled Trial (RCT)	Sample : 22 post-stroke rehbilitation patients with lower extremity spasticity, aged 30-70 years Intervention: The feet were immersed up to the knee joint in 41°C water for 15 minutes while seated. Control: Standard care	• Footbath has been shown to reduce spasticity in stroke patients both immediately after the intervention ($p<0.05$) and 30 minutes post-intervention ($p<0.05$). • Footbath significantly affects body temperature both immediately after ($p<0.05$) and 30 minutes post-intervention ($p<0.05$), as well as skin temperature immediately after the intervention ($p<0.05$). • Blood pressure and heart rate showed no significant differences between the intervention group and the control group ($p>0.05$)
2	The Effect of Foot Bath on Physiological Parameters and Anxiety in Patients With Acute Stroke: A Randomized Controlled Trial (Seidi et al., 2023)	Sample : 60 stroke patients hospitalized in the neurology ward Intervention: The feet are soaked up to the ankle in water at	• There was a significant difference in anxiety levels before and after the intervention within the intervention group ($p=0.001$). • No significant difference was found between the intervention and control

No	Authors, Year, Objective & Design	Sample & Intervention	Result
	Objective: To determine the effects of footbaths on physiological parameters and anxiety in stroke patients. Study Design: Randomized Controlled Trial (RCT)	a temperature of 40°C for 15 minutes. Control: Standard care	groups for systolic blood pressure (p=0.298), diastolic blood pressure (p=0.867), heart rate (HR, p=0.060), respiratory rate (RR, p=0.067), temperature (p=0.526), oxygen saturation (SpO_2, p=0.527), and anxiety levels (p=0.451).
3	The Effectiveness of Acupressure and Warm Foot Soak Hydrotherapy on Increasing Muscle Strength and Range of Motion among Non-Hemorrhagic Stroke Patients (Setiawan et al 2021) Tujuan : To determine the effectiveness of warm footbath hydrotherapy in improving muscle strength and range of motion in non-hemorrhagic stroke patients. Desain penelitian : Randomized Controlled Trial (RCT)	Sample : 30 non-hemorrhagic stroke patients Intervention: Footbath with warm water for 20 minutes, three times a day for 4 days. Control: Standard care (acupressure at GV 20, Li 4, ST 36, and Ki points).	• The group receiving a combination of acupressure and footbath showed greater improvement in muscle strength and range of motion for both upper and lower extremities compared to the group receiving only acupressure, even though the difference did not reach statistical significance (p>0.05).
4	The Effects Of Aroma Massage And Foot Bath On Psychophysiological Response In Stroke Patients. (Lee et al 2017) Objective: To test the effect of back massage and footbath with a mixed essential oil on the psychophysiological response in stroke patients. Study Design: Randomized Controlled Trial (RCT)	Sample: 14 hemiplegia patients due to stroke within 6 months to 2 years Intervention: A combination of back massage and foot soaking up to the ankle in 40°C water for 30 minutes, five times a week. Control: Standard care	• There were significant differences in physical stress (p=0.05), psycho-emotional stress (p=0.01), body temperature (p=0.05), mood status (p=0.01), and sleep satisfaction (p=0.001) between the intervention and control groups.
5	Effect Of A Footbath Program On Heart Rate Variability, Blood Pressure, Body Temperatire And Fatigue In Stroke Patients. (Son & Yoo, 2016) Objective: To evaluate the impact of the footbath program on heart rate variability, blood pressure, body temperature, and fatigue among hemiparetic stroke patients. Study Design: Quasi-experiment.	Sample: 40 chronic stroke patients with hemiplegia Intervention: Foot immersion was performed to a height of 20 cm in water with a temperature of 38-41°C for 30 minutes, three times a week for 3 weeks (9 sessions). Control: Standard care	• There was a significant difference in parasympathetic nerve activity (p=0.02), fatigue (p<0.001), skin temperature of the back of the hand (p<0.001), and the back of the foot (p<0.001) between the intervention and control groups. • Sympathetic nerve activity no significant difference (p=0.096), blood pressure (p=0.367), and body temperature (p=0.252) between the control and intervention groups
6	Skin Temperature Changes During A Footbath In Patients Who Had Had A Stroke With Consequent Sensory Impairment. (Toki et al., 2015) tive: To determine changes in skin temperature on the affected and unaffected sides, in additional to variations in temperature perception and comfort experienced by stroke patients with sensory impairment during a footbath. Study design: Quasi-experiment	Sample : 20 stroke patients with sensory impairment and 20 healthy adults Intervention: Both groups will receive a footbath with a water level of 18 cm from the soles of the feet, using 13 liters of water at a temperature of 42°C for 15 minutes.	• The stroke group showed an increase in parasimpatic nerve activity, skin temperature, and comfort levels comparable to the healthy group after footbath. In fact, the comfort level in the stroke group was higher than the healthy group. • There were no significant differences in blood pressure and heart rate before and after footbath in the stroke group.

Table 4 summarizes the outcomes examined in the selected studies for comparison across articles.

Table 4.
Article Systesis

No	Outcome	Matsumoto et al(2014)	Seidi et al (2023)	Setiawan et al(2021)	Lee et al (2017)	Son & Yoo (2016)	Toki et al (2015)
1	Blood pressure	√	√			√	√
2	Heart rate	√	√			√	√
3	Heart rate variability					√	√
4	RR and SpO2		√				
5	Body temperature		√		√	√	
6	Skin temperature	√					√
7	Muscle spasticity	√					
8	Muscle strength			√			
9	Fatigue					√	
10	Physical stress				√		
11	Emotional stress				√		
12	Mood				√		
13	Anxiety		√				
14	Sleep satisfaction				√		
15	Comfort						√

The synthesis of reviewed studies shows that footbath interventions have been investigated across a wide range of physical and psychological outcomes, including blood pressure, heart rate, muscle spasticity, fatigue, anxiety, and sleep satisfaction. While several studies consistently reported benefits in cardiovascular and relaxation-related measures, evidence on outcomes such as mood, comfort, and spasticity remains limited to only one or two studies.

DISCUSSION

Stroke management requires more than pharmacological therapy; it also needs non-pharmacological interventions to support recovery and improve quality of life. One promising approach is footbath therapy, which offers both physical and psychological benefits. The heat transfer from warm water, as described by Pennes' Bioheat Equation, triggers vasodilation, enhances blood flow, and promotes muscle relaxation, thereby reducing spasticity [8,22]. Additionally, footbaths influence autonomic nerve activity by stimulating TRPV3 and TRPV4, enhancing parasympathetic function, and reducing sympathetic activity [6,9,23]. These effects help restore autonomic balance, which is often disrupted in stroke patients, making footbath a valuable addition to rehabilitation.

Temperature, Duration, and Water Level of Footbaths

The six studies on footbath therapy showed variations in temperature, immersion height, and duration. Water temperatures ranged from 38°C to 42°C, with one study only mentioning warm water without specifying the exact temperature. Immersion levels varied from the ankle to the knee, while one study did not provide details. Footbath durations ranged from 15 to 30 minutes across the studies. Temperatures 34°C to 42°C are perceived by thermoreceptors as warm and non-harmful [24]. The safest and most comfortable footbath temperatures and durations are 42°C for 10 minutes, 40°C for 15 minutes, and 38°C for 20-25 minutes [25,26]. The feet are rich in blood vessels, nerves, and thin layers of fat, making them highly responsive to thermal stimuli. Although applied locally, footbaths have a systemic effect on the body through

thermovasodilation and activation of parasympathetic nervous system activity [25].

Effects of Footbaths on Physical Aspect in Stroke Patients

Three studies that reported blood pressure and heart rate did not differ significantly between the footbath and control groups [14,15,18]. Similarly, another study found no changes in stroke patients before and after a footbath, although healthy individuals showed significant reductions in blood pressure [19]. A study noted that footbaths effectively lower blood pressure in hypertensive patients when applied for 10 days to 6 months, highlighting the importance of duration and frequency [13]. The absence of immediate effects on blood pressure and heart rate suggests footbaths are safe for stroke patients, as they do not disrupt hemodynamic stability, supporting their role in non-pharmacological rehabilitation.

Two studies examined the effects of footbaths on parasympathetic activity. One study reported an increase in stroke patients, although it was not statistically significant [18]. Another study found no significant difference between stroke and healthy groups, but stroke patients showed a higher increase during the footbath [19]. In healthy individuals, HF activity rose between the 4th–10th minute, indicating autonomic relaxation [9]. Increased parasympathetic and reduced sympathetic activity in stroke patients correlate with better outcomes and lower mortality [27]. Despite autonomic dysregulation in stroke patients, these findings suggest that footbaths may serve as a beneficial therapeutic approach to enhance autonomic balance and recovery.

Three studies examined footbath's effects on body temperature with varying results. One study reported differences differences in body temperature between the footbath and control groups immediately and 30 minutes post-intervention [14], while two studies found no significant differences [15,18]. Measurement techniques varied: one study used a sublingual probe [14], another used an infrared thermometer on the ear and forehead [18] , and the last did not specify methods [15]. Body temperature readings depend on thermometer type and measurement site, as infrared forehead thermometers do not accurately reflect core temperature [28]. Regarding extremity temperature, one study found no significant differences between footbath and control groups [14], whereas another reported similar skin temperature increases in both stroke and healthy groups [19]. However, stroke patients' skin was more affected by environmental temperature, whereas healthy individuals maintained greater thermal stability. This finding aligns with a study that observed temperature asymmetry in stroke patients, with lower temperatures on the paretic side due to impaired thermoregulation and reduced blood flow [29]. These findings suggest footbaths may benefit both stroke patients and healthy individuals by increasing skin temperature while considering stroke-related physiological differences.

One study found that footbaths effectively reduce spasticity and improve muscle tone in stroke patients, as measured by F-amplitude wave, F/M ratio, and F-wave [14]. Another study examined footbath's effects on muscle strength and range of motion (ROM), showing improvements in the intervention group (acupressure + footbath) despite no significant difference from the control group (acupressure only) [16]. Thermal stimulation activates broader brain areas than tactile or mechanical stimulation, similar to motor [30]. Repetitive motor exercises and sensory stimulation enhance neuroplasticity and cortical reorganization, while water temperatures above 34°C can increase muscle strength [31]. Another study also highlighted thermal stimulation's role in post-stroke motor recovery [32]. These findings suggest footbaths as a valuable

complementary intervention to enhance physiotherapy outcomes and support motor recovery in stroke patients.

Footbaths significantly impact physical well-being by reducing stress [21], increasing comfort [19], and reducing fatigue [18]. Poor circulation contributes to stress and fatigue [33], while footbaths promote vasodilation, enhancing blood flow, oxygenation, and nutrient delivery to the brain, thereby reducing fatigue [34]. Heat from footbaths spreads through circulation, inducing comfort and reducing anxiety [35]. Additionally, increased temperature opens skin pores, facilitating detoxification, relaxing muscles, enhancing red blood cell activity, and relieving pain [36]. These benefits make footbaths a valuable intervention for stroke patients' physical well-being.

Effects of Footbaths on Psychological Aspect in Stroke Patients

Three studies showed that footbaths provide significant psychological benefits for stroke patients by reducing stress, anxiety, and improving sleep satisfaction [15,19,21]. They promote relaxation by enhancing the distal-proximal temperature gradient [37], lowering core body temperature [38], and decreasing parasympathetic activity [9]. The warmth distribution further induces comfort and reduces anxiety [35]. These effects make footbaths a promising non-pharmacological therapy to support holistic recovery in stroke patients.

There are three articles that examine the impact of footbaths on the psychological aspects of stroke patients, including psycho-emotional stress, mood, and sleep satisfaction [21], anxiety [15], and comfort [19]. One study showed that footbaths can significantly reduce psycho-emotional stress and increase sleep satisfaction [21]. Another study reported that footbaths combined with back massages can significantly reduce anxiety in stroke patients [15]. Footbaths can induce an increase in the distal-proximal temperature gradient, which helps facilitate the onset of sleep, contributing to better sleep quality in the elderly [37]. To sleep comfortably, the lowering of central body temperature and an increase of skin temperature of the extremities are required [38]. A reduction in parasympathetic nervous system activity also contributes to improved sleep quality and reduced anxiety by helping the body enter a relaxed state. When blood flows through tissues exposed to heat, it carries warmth to other areas of the body where the sensation of warmth can induce comfort and reduce anxiety [35]. The findings above suggest that footbaths provide significant psychological benefits for stroke patients, particularly in terms of alleviating anxiety, enhancing comfort, and increasing sleep satisfaction. These psychological benefits, in turn, accelerate the overall recovery process. The implementation of footbaths as part of non-pharmacological rehabilitation therapy can have a positive effect on the psychological well-being of stroke patients, making it a promising therapeutic strategy to support recovery not only physically but also holistically psychologically.

Footbaths can not only be used as a single therapy but also have greater potential when combined with other interventions, thereby enhancing their benefits. There are two articles that describe the application of combined footbath therapy for stroke patients, specifically with back massage [15] and acupressure [16]. This combination provides more optimal results in supporting patient rehabilitation. A meta-analysis also indicates that combining footbaths with acupoint massage is safe and more effective than single interventions in patients with diabetic peripheral neuropathy [39]. This suggests that footbaths can be further developed as part of a multimodal approach to improve clinical outcomes for stroke patients as well as other conditions requiring rehabilitative therapy.

Implications for Nursing Practice

Footbath therapy represents a non-invasive, simple, low-cost, and potentially low-risk supportive intervention that may be integrated into the care of clinically stable stroke patients. In hospital settings, it may be incorporated into holistic nursing care to promote comfort, relaxation, and symptom management, including spasticity or anxiety. Its procedural simplicity also supports continued implementation in community and home-based care settings with appropriate nursing education and supervision. However, given that neurological damage in stroke patients may result in altered physiological responses compared to healthy individuals, careful clinical assessment is essential to ensure safe application. The establishment of standardized protocols and thorough evaluation of patient safety should therefore guide its implementation across care settings.

Limitation of The Evidence

While the findings suggest potential benefits, the interpretation of these results should be undertaken with caution. Several methodological limitations within the current body of evidence may restrict the strength of the conclusions. Most studies involved relatively small sample sizes (ranging from 14 to 60 participants), which may reduce statistical power and limit generalizability. Intervention periods were generally brief, often consisting of single sessions or short-term programs, thereby limiting insight into sustained or long-term effects. Considerable heterogeneity was also observed across study protocols, including variations in water temperature, duration, frequency, and the incorporation of combined interventions such as acupressure or massage. This variability complicates direct comparison across studies and makes it difficult to isolate the independent contribution of footbath therapy. The limited availability of follow-up data constrains interpretation of the sustainability of the intervention's effects over time.

CONCLUSION

Footbath therapy demonstrates promising potential as a supportive non-pharmacological intervention in stroke rehabilitation. Preliminary evidence suggests beneficial effects on autonomic regulation and symptom-related outcomes, including spasticity, fatigue, and anxiety. However, further high-quality randomized trials with larger samples and standardized protocols are required before routine clinical implementation can be recommended.

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BIBLIOGRAPHY

[1] Markus HS. The global burden of stroke. International Journal of Stroke 2023;18:632–3. https://doi.org/10.1177/17474930231181677.

[2] Feigin VL, Owolabi MO, Feigin VL, Abd-Allah F, Akinyemi RO, Bhattacharjee N V., et al. Pragmatic solutions to reduce the global burden of stroke: a World Stroke Organization–Lancet Neurology Commission. The Lancet Neurology 2023;22:1160–206. https://doi.org/10.1016/S1474-4422(23)00277-6.

[3] Ministry of Health of the Republic of Indonesia. Survei Kesehatan Indonesia 2023 (SKI). Ministry of Health of the Republic of Indonesia 2023:235.

[4] Miller EL, Murray L, Richards L, Zorowitz RD, Bakas T, Clark P, et al. Comprehensive overview of nursing and interdisciplinary rehabilitation care of the stroke patient: A scientific statement from the American heart association. Stroke 2010;41:2402–48. https://doi.org/10.1161/STR.0b013e3181e7512b.

[5] Bonifacio GB, Ward NS, Emsley HCA, Cooper J, Bernhardt J. Optimising rehabilitation and recovery after a stroke. Practical Neurology

2022;22:478–85. https://doi.org/10.1136/practneurol-2021-003004.

[6] Kashio M, Tominaga M. TRP channels in thermosensation. Current Opinion in Neurobiology 2022;75:102591. https://doi.org/10.1016/j.conb.2022.102591.

[7] Celine NC, Clifford IU. A Review of Heat Therapy in African Traditional Medicine. Journal of Health and Environmental Research 2020;6:87. https://doi.org/10.11648/j.jher.20200603.16.

[8] Lindquist R, Tracy MF, Snyder M. Complementary therapies in nursing: Promoting integrative care. Springer Publishing Company; 2023. https://doi.org/https://doi.org/10.1891/9780826194992.

[9] Maeda K, Ohba T, Kato T, Shuda A. Effects of footbaths on prefrontal cortex activity and autonomic nervous function: A randomized controlled crossover trial. Journal of International Nursing Research 2023;2:e2021-0027-e2021-0027. https://doi.org/10.53044/jinr.2021-0027.

[10] Unver S, Yildirim M. The Effectiveness Of Warm-Water Footbath On Pain Management Of Patients At Healthcare Settings: A Systematic Review. Sağlık Bilimleri Dergisi-Journal Of Health Sciences 2024;33:436–43. https://doi.org/10.34108/eujhs.1490584.

[11] Nasiri K, Shriniy M, Pashaki NJ, Aghamohammadi V, Saeidi S. The effect of foot bath on sleep quality in the elderly : a systematic review. BMJ Geriatrics 2024;24:1–7. https://doi.org/https://doi.org/10.1186/s12877-023-04590-x.

[12] Warisyu B, Nurachmah E, Maria R. Effects of Warm Water Foot Soak Therapy on Blood Pressure in Hypertension Sufferers: A Narrative Review. Jurnal Berita Ilmu Keperawatan 2023;16:2023.

[13] Wu T, Zhou L, Liao X, He Y, Xu R, Luo D. Efficacy and safety of chinese herbal foot bath for hypertension: A systematic review and meta-analysis. Complementary Therapies in Medicine 2024;81:103029. https://doi.org/10.1016/j.ctim.2024.103029.

[14] Matsumoto S, Shimodozono M, Etoh S, Noma T, Uema T, Ikeda K, et al. Anti-spastic effects of footbaths in post-stroke patients: A proof-of-principle study. Complementary Therapies in Medicine 2014;22:1001–9. https://doi.org/10.1016/j.ctim.2014.09.006.

[15] Seidi J, Gheshlagh RG, Nourifard Y, Dehvan F. The Effect of Foot Bath on Physiological Parameters and Anxiety in Patients With Acute Stroke: A Randomized Controlled Trial. Iranian Rehabilitation Journal 2023;21:503–12. https://doi.org/10.32598/irj.21.3.1874.1.

[16] Setiawan LR, Mardiyono M, Santjaka A. The Effectiveness of Acupressure and Warm Foot Soak Hydrotherapy on Increasing Muscle Strength and Range of Motion among Non-Hemorrhagic Stroke Patients. International Journal of Nursing and Health Services (IJNHS) 2021;4:430–9.

[17] Lee JH, Seo EK, Shim JS, Chung SP. The effects of aroma massage and foot bath on psychophysiological response in stroke patients. Journal of Physical Therapy Science 2017;29:1292–6. https://doi.org/10.1589/jpts.29.1292.

[18] Son YL, Yoo MS. Effects of a Footbath Program on Heart Rate Variability, Blood Pressure, Body Temperature and Fatigue in Stroke Patients. Journal of Korean Biological Nursing Science 2016;18:51–9.

[19] Toki K, Yamai T, Fukai K. Skin temperature changes during a footbath in patients who had had a stroke with consequent sensory impairment. Japan Journal of Nursing Science 2015;12:276–86. https://doi.org/10.1111/jjns.12066.

[20] Matsumoto S, Shimodozono M, Etoh S, Shimozono Y, Tanaka N, Kawahira K. Beneficial effects of footbaths in controlling spasticity after stroke. International Journal of Biometeorology 2010;54:465–73. https://doi.org/10.1007/s00484-009-0300-x.

[21] Lee JH, Seo EK, Shim JS. The effects of aroma massage and foot bath on psychophysiological response in stroke patients. The Journal of Physical Therapy Science 2017;29:1292–6. https://doi.org/doi: 10.1589/jpts.29.1292.

[22] Turkyilmazoglu M. Heat transfer from warm water to a moving foot in a footbath. Applied Thermal Engineering 2016;98:280–7. https://doi.org/10.1016/j.applthermaleng.2015.12.027.

[23] Wang H, Siemens J. TRP ion channels in thermosensation, thermoregulation and metabolism. Temperature 2015;2:178–87. https://doi.org/10.1080/23328940.2015.1040604.

[24] Tan CL, Knight ZA. Regulation of Body Temperature by the Nervous System. Neuron 2018;98:31–48. https://doi.org/10.1016/j.neuron.2018.02.022.

[25] Xu F-H, Uebaba K. Temperature Dependent Circulatory Changes by Footbath-Changes of Systemic, Cerebral and Peripheral Circulation. The Journal of The Japanese Society of Balneology, Climatology and Physical Medicine 2003;66:214–26.

[26] Kuderer S, Vagedes K, Szöke H, Kohl M, Joos S, Gündling PW, et al. Do ginger footbaths improve symptoms of insomnia more than footbaths with warm water only? – A randomized controlled study. Complementary Therapies in Medicine 2022;67. https://doi.org/10.1016/j.ctim.2022.102834.

[27] Yperzeele L, van Hooff RJ, Nagels G, De Smedt A, De Keyser J, Brouns R. Heart rate variability and baroreceptor sensitivity in acute stroke: A systematic review. International Journal of Stroke 2015;10:796–800. https://doi.org/10.1111/ijs.12573.

[28] Chen HY, Chen A, Chen C. Investigation of the impact of infrared sensors on core body temperature monitoring by comparing measurement sites. Sensors (Switzerland) 2020;20. https://doi.org/10.3390/s20102885.

[29] Alfieri FM, Massaro AR, Filippo TR, Portes LA, Battistella LR. Evaluation of body temperature in individuals with stroke. NeuroRehabilitation 2017;40:119–28. https://doi.org/10.3233/NRE-161397.

[30] Chen JC, Liang CC, Shaw FZ. Facilitation of sensory and motor recovery by thermal intervention for the hemiplegic upper limb in acute stroke patients: A single-blind randomized clinical trial. Stroke 2005;36:2665–9. https://doi.org/10.1161/01.STR.0000189992.06654.ab.

[31] Farnia F, Mokhtari S, Rahmanian M. Effect of Warm Foot Bath on Fatigue among Diabetic Old Adults. Elderly Health Journal 2019;5:102–7. https://doi.org/10.18502/ehj.v5i2.2156.

[32] Chen JC, Lin CH, Wei YC, Hsiao J, Liang CC. Facilitation of motor and balance recovery by thermal intervention for the paretic lower limb of acute stroke: A single-blind randomized clinical trial. Clinical Rehabilitation 2011;25:823–32. https://doi.org/10.1177/0269215511399591.

[33] Anilda A, Thenmozhi P. Effectiveness of hot water foot bath on level of fatigue among elderly. International Journal and Research 2013;4:574–6.

[34] El-Naggar NSM, Mohamed HR. Effectiveness of Warm Water Footbath on Temperature and Fatigue among Children with Fever. Evidence-Based Nursing Research 2021;2:11. https://doi.org/10.47104/ebnrojs3.v2i4.179.

[35] Shim J-M. The Effects of Wet Heat and Dry Heat on the Gait and Feet of Healthy Adults. Journal of Physical Therapy Science 2014;26:183–5. https://doi.org/https://doi.org/10.1589/jpts.26.183.

[36] Ezheltha SSD, Sharmila JRSS. Effectiveness of Hot Foot Bath Versus Exercises on Reducing Pain among Patients with Osteoarthritis. International Journal of Nursing Education 2015;7:70. https://doi.org/10.5958/0974-9357.2015.00137.3.

[37] Ong CJA, Opiña EJM, Orallo AR, Teollie N, Ortega C, Joan R, et al. Effects of Footbath in Improving Sleep Quality Among Filipino Elderly. Journal of Social Health 2020;1:31–55.

[38] Mitsuno T, Moriya S. A pilot study of the effect of bathing time on thermal sensation to get a good night's sleep. Health Informatics and Biomedical Engineering Applications 2023;78:57–65. https://doi.org/10.54941/ahfe1003455.

[39] Fu Q, Yang H, Zhang L, Liu Y, Li X, Dai M, et al. Traditional Chinese medicine foot bath combined with acupoint massage for the treatment of diabetic peripheral neuropathy: A systematic review and meta-analysis of 31 RCTs. Diabetes/Metabolism Research and Reviews 2020;36:1–15. https://doi.org/10.1002/dmrr.3218.