



PARAFFIN BATH AND HAND EXERCISE THERAPY TO IMPROVE HAND FUNCTION IN OLDER ADULTS

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Abstract :

Hand pain and joint stiffness are common complaints among older adults and reduce independence in daily activities. This community service program aimed to reduce hand complaints, improve hand functional ability, and increase participants' understanding of self-management among members of the elderly integrated health post (Posyandu Lansia) in Tohudan Village, Colomadu, Karanganyar, Indonesia. Thirty participants were involved, consisting of older adults with hand complaints, health cadres, and family caregivers. The program comprised health education through lectures, demonstrations, and question-and-answer sessions, followed by paraffin bath therapy at 40–44°C combined with hand exercise therapy in the form of joint mobilisation, intrinsic muscle exercise, and gripping exercise, delivered once a week for four weeks. Participants' understanding was measured before and after the program using a five-item questionnaire with a four-point scale. The mean understanding score increased from 6.30 ± 1.09 to 16.90 ± 2.28 out of 20, a mean gain of 10.60 ± 2.30 points that was statistically significant (paired t-test, $p < 0.001$; Cohen's $d = 4.61$). All participants reached at least the understand category and rated the program as highly beneficial (91.9%).

Keywords : paraffin bath, hand exercise, older adults, hand function, community service

INTRODUCTION

The hand is the main support for almost all activities of daily living, from productive work to independence in self-care. Functional hand disorders are frequently found in older adults along with the declining performance of the musculoskeletal and nervous systems, particularly in the distal joints. Most functional hand problems in this population originate from degenerative joint disorders and inflammation of the tendon sheath. Hand osteoarthritis mainly occurs in middle-aged women with a peak incidence at the age of 50 years and most commonly affects the distal interphalangeal and first carpometacarpal joints, producing pain, joint stiffness, reduced hand ability, and ultimately a decline in quality of life (Aksanyar, Yilmaz, Karaarslan, Yilmaz, & Karpuz, 2022). Stenosing tenosynovitis is also more common in women, with the risk increasing up to six times in people with diabetes mellitus and rheumatoid arthritis, is closely related to repetitive joint movements, and causes pain in the metacarpophalangeal joints, reduced gripping ability, triggering of the fingers, and flexor contracture in chronic conditions (Wah et al., 2020).

One physiotherapy service that can be used to address these problems is the thermal modality of paraffin bath. Paraffin bath increases tissue temperature by 7.5°C in the joint capsule and 4.5°C in muscle tissue, thereby increasing tissue



extensibility and elasticity, relaxing skeletal muscle, reducing joint capsule restriction, and producing local vasodilation that supports recovery, the removal of metabolic waste and pain substances, increased lymphatic flow, and faster absorption of exudate (Myrer, Johnson, Mitchell, Measom, & Fellingham, 2011). This local vasodilation reduces pain, improves muscle contraction that was previously inhibited by pain, and increases hand functional ability and quality of life (Dilek et al., 2013). The paraffin temperature used in therapy generally ranges from 40 to 44°C and must first be tested against the heat tolerance of the tissue (Iswarya, Azeela Begham, Singh, & Govind, 2018).

Empirical evidence supports the use of this modality. In 36 subjects with hand osteoarthritis, paraffin bath significantly reduced pain ($p < 0.001$) and improved the Duruoz Hand Index score and gripping ability, both immediately after therapy and after three months of therapy (Öncel, Küçükşen, Ecesoy, Sodalı, & Yalçın, 2021). The effectiveness of the modality increases further when it is combined with exercise therapy or joint mobilisation, with significant differences in pain reduction ($p = 0.001$) and thumb function score ($p = 0.003$) compared with mobilisation without paraffin bath (Sibtain, Khan, & Shakil-ur-Rehman, 2012).

More recent evidence has strengthened the position of this modality within community practice. A meta-analysis of randomised controlled trials concluded that paraffin bath therapy significantly reduces visual analogue scale scores and improves grip and pinch strength across a range of hand diseases, including osteoarthritis, carpal tunnel syndrome and post-traumatic stiffness (Kim et al., 2023). An updated systematic review of treatments for hand osteoarthritis likewise reaffirmed the central role of non-pharmacological interventions, particularly exercise and patient education, in improving pain and function with minimal adverse events (Kjeken et al., 2025). At the community level, structured finger and hand exercise programmes have proved feasible and acceptable for older adults of differing physical status (Liu et al., 2024), and a community-based paraffin therapy programme involving 40 older adults in Aceh, Indonesia, increased mean grip strength from 14.8 kg to 19.6 kg while reducing finger pain from 6.7 to 3.1 and stiffness from 7.4 to 3.8 over three weeks, with sustainability pursued through cadre training (Laila, Fithriany, Kusma, Jannah, & Fadlina, 2026).

A situational analysis in Tohudan Wetan, Tohudan Village, Colomadu District, showed a heterogeneous community in terms of education and socioeconomic status, a high level of social activity, and a routinely functioning elderly integrated health post as a potential base for community empowerment. On the other hand, many older adults complained of pain and stiffness in the hand joints that interfered with functional activities, while their knowledge of the causes and appropriate management was still minimal, so that the condition risked becoming worse. Previous studies have largely examined paraffin bath in clinical settings with clinical outcome measures, whereas its delivery as a community-based service accompanied by an educational component to build self-management capacity in older adults has rarely been reported. This community service program was therefore conducted to deliver paraffin bath therapy

combined with hand exercise therapy and to improve the understanding of older adults, cadres, and family caregivers regarding the independent management of hand complaints.

RESEARCH METHOD

This activity was a community service program using an educational and direct service approach, carried out at the elderly integrated health post of Tohudan Wetan Hamlet, Tohudan Village, Colomadu District, Karanganyar Regency, Central Java, Indonesia, in 2026. The partner was the elderly integrated health post group of Tohudan Village, supported by the village government. Participants were 30 people selected by total sampling from members who attended the program, consisting of 22 older adults with complaints of pain and/or stiffness in the hand joints, 5 health cadres, and 3 family caregivers.

The program was implemented in five stages: preparation and licensing; field survey, participant registration, and initial screening including screening for thermal contraindications; health education using lectures, demonstrations, and question-and-answer sessions; physiotherapy service in the form of paraffin bath at 40–44°C on both hands combined with hand exercise therapy (joint mobilisation, intrinsic muscle exercise, and gripping exercise) once a week for four weeks; and final evaluation. Every session was preceded by a check of general condition and heat tolerance and was supervised by the implementing team assisted by three physiotherapy students.

Data were collected using a participant understanding questionnaire consisting of five items that covered the concept of hand pain and stiffness in older adults and its danger signs, the definition and benefits of paraffin bath, therapy preparation, the sequence of therapy and hand exercise, and safety and independence in performing the therapy. Each item was rated on a four-point scale (1 = do not understand, 2 = poorly understand, 3 = understand, 4 = fully understand), giving a total score range of 5–20 with the categories do not understand (5–8), poorly understand (9–12), understand (13–16), and fully understand (17–20). A further seven items measured the perceived benefit of the program using the same four-point scale (total score range 7–28). The questionnaire was completed before the education session (pre-test) and after the whole series of therapy was finished (post-test); for participants with reading difficulties the items were read out by the officer without directing the answers.

Data were analysed descriptively as frequencies, percentages, means, and standard deviations, and the difference between pre-test and post-test scores was tested using a paired t-test with an effect size (Cohen's d) calculation. The level of significance was set at $p < 0.05$.

FINDINGS AND DISCUSSION

The characteristics of the 30 participants who completed both measurements are presented in Table 1.

Table 1 : Characteristics of participants (n = 30)

Characteristic	Category	n	%
Sex	Male	9	30.0
	Female	21	70.0
Age group	< 60 years	8	26.7
	60–69 years	12	40.0
	≥ 70 years	10	33.3
Role	Older adult participant	22	73.3
	Health cadre	5	16.7
	Family caregiver	3	10.0
Total		30	100.0

Most participants were female (70.0%) and aged 60 years or over (73.3%), with an age range of 39–76 years. This composition reflects the profile of elderly integrated health post members in Indonesia, which is dominated by older women, and is consistent with the epidemiology of hand osteoarthritis that mainly affects women (Aksanyar et al., 2022).

The distribution of understanding categories before and after the program is presented in Table 2.

Table 2 : Distribution of understanding categories before and after the program

Category (score)	Pre-test n	Pre-test %	Post-test n	Post-test %
Do not understand (5–8)	30	100.0	0	0.0
Poorly understand (9–12)	0	0.0	0	0.0
Understand (13–16)	0	0.0	12	40.0
Fully understand (17–20)	0	0.0	18	60.0
Total	30	100.0	30	100.0

Before the program all participants (100%) were in the do-not-understand category. After the program no participant remained in the do-not-understand or poorly-understand categories: 12 participants (40.0%) reached the understand category and 18 participants (60.0%) reached the fully-understand category, so that all participants achieved at least the understand category.

Descriptive statistics of the understanding score and the result of the difference test are presented in Table 3.

Table 3 : Understanding scores before and after the program (n = 30)

Statistic	Pre-test	Post-test
Score range achieved	5–8	13–20
Mean ± standard deviation	6.30 ± 1.09	16.90 ± 2.28
Median	6.0	17.0
Mean understanding value (%)	31.5	84.5
Mean gain (post-test – pre-test)	10.60 ± 2.30 points (relative increase 168.3%)	
Paired t-test	t = 25.260; df = 29; p < 0.001; Cohen's d = 4.61	

The mean understanding score increased from 6.30 ± 1.09 (31.5%) to 16.90 ± 2.28 (84.5%), a mean gain of 10.60 ± 2.30 points or a relative increase of 168.3%. The paired t-test showed a significant difference between the scores before and after the program ($p < 0.001$) with a very large effect size (Cohen's $d = 4.61$). Every participant experienced an increase in score, with the smallest gain of 6 points and the largest of 14 points.

The change in the mean score of each questionnaire item is presented in Table 4.

Table 4 : Mean score of each understanding item before and after the program

No	Item of understanding	Pre-test	Post-test	Gain
1	Hand pain and joint stiffness in older adults and its danger signs	1.23	3.30	+2.07
2	Definition and benefits of paraffin bath therapy	1.30	3.30	+2.00
3	Therapy preparation: equipment, paraffin temperature, tolerance test, duration	1.30	3.57	+2.27
4	Sequence of paraffin bath therapy and hand exercise therapy	1.17	3.40	+2.23
5	Safety and independence: contraindications, warning signs, home exercise	1.30	3.33	+2.03
	Mean of all items	1.26	3.38	+2.12

All items increased, with the highest gain in the item on therapy preparation (+2.27) and the lowest in the item on the definition and benefits of paraffin bath (+2.00). The highest post-test mean was also found in the item on therapy preparation, which suggests that practical material delivered through demonstration and hands-on practice is easier for older adults to absorb than conceptual material. This finding supports the use of demonstration and direct practice as the main educational method in community programs for older adults, in whom learning through physical experience is more effective than verbal explanation alone.

The participants' assessment of the benefit of the program is presented in Table 5.

Table 5 : Participants' assessment of programme benefit (n = 30)

No	Item of benefit	Mean (1-4)	Category
1	Health education material delivered by the team	3.67	Highly beneficial
2	Demonstration and direct practice of paraffin bath	3.80	Highly beneficial
3	Hand exercise therapy taught by the team	3.63	Highly beneficial
4	Educational media used (leaflet/poster/video)	3.53	Highly beneficial
5	Assistance by the team during the activity	3.63	Highly beneficial
6	Change in hand pain and stiffness after therapy	3.80	Highly beneficial
7	Continuation of the program at the health post	3.67	Highly beneficial

No	Item of benefit	Mean (1-4)	Category
	Mean of all items	3.68	Highly beneficial

The mean total benefit score was 25.73 out of a maximum of 28 (91.9%), and all participants (100%) placed the program in the highly beneficial category. The highest ratings were given to the demonstration and direct practice of paraffin bath and to the perceived change in hand pain and stiffness after therapy (mean 3.80), which indicates that participants felt an immediate benefit from the service. The lowest rating concerned the educational media (mean 3.53), a finding consistent with the suggestions written by participants, who asked for larger print in the leaflets. Suggestions were given by 23 of the 30 participants (76.7%) and were grouped into nine themes: continuation of the activity, improvement of educational media, scheduling of the activity, involvement of the family, additional health screening, addition of equipment, extension to other hamlets, further assistance, and specific training for cadres.

The improvement in understanding obtained in this program is in line with the mechanism of paraffin bath reported in previous studies. The increase in tissue temperature produced by paraffin raises tissue extensibility and produces local vasodilation that reduces pain and joint stiffness (Myrer et al., 2011), so that participants can directly feel the effect of the therapy within a single session. This direct experience appears to strengthen the retention of educational material, because the concepts explained during the education session are immediately confirmed by the participants' own bodily experience.

The combination of paraffin bath with hand exercise therapy used in this program also follows the evidence that a combined approach is superior to a single modality. Combining paraffin bath with mobilisation techniques produced a greater reduction of pain and a better thumb function score than mobilisation alone (Sibtain et al., 2012), while the combination of paraffin wax bath with intrinsic muscle exercise reduced pain and improved precision gripping in rheumatoid hands (Iswarya et al., 2018). Longer-term clinical benefit has also been documented, in which the improvement in hand function and grip strength persisted at a three-month follow-up (Öncel et al., 2021; Dilek et al., 2013).

The pattern of results is also consistent with the Indonesian community-based paraffin programme reported by Laila et al. (2026), in which cadre involvement and household-level education were identified as the key conditions for sustaining the benefit after the programme ended.

From the perspective of community empowerment, the involvement of cadres and family caregivers, who made up 26.7% of participants, is an important element for sustainability. Cadres who understand the preparation, contraindications, and sequence of hand exercise can guide the activity independently during routine health post sessions, while family caregivers can supervise home exercise. The main limitation of this report is that the evaluation presented here is restricted to participants' understanding and perceived benefit, so that changes in pain intensity and hand function measured by clinical

instruments are reported separately, and the absence of a control group means that the improvement cannot be attributed solely to the intervention.

CONCLUSION

The community service program combining paraffin bath therapy at 40–44°C with hand exercise therapy and structured health education substantially improved the understanding of older adults, health cadres, and family caregivers at the elderly integrated health post of Tohudan Village regarding hand complaints and their independent management. The mean understanding score rose from 6.30 to 16.90 out of 20, a significant gain of 10.60 points ($p < 0.001$) with a very large effect size, and every participant moved from the do-not-understand category to at least the understand category. Participants also considered the program highly beneficial, with the highest ratings given to the direct practice of the therapy and to the perceived change in hand complaints. These results indicate that paraffin bath combined with hand exercise can be delivered as a community-based physiotherapy service in which education is reinforced by direct practice. Sustainability should be pursued through specific training for cadres, improvement of educational media for older readers, and the integration of hand exercise into routine health post activities. Further studies with a control group and clinical outcome measures are recommended to confirm the effect of the program on pain and hand function.

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