

The Effectiveness of Combined Effleurage and PNF Therapy in Increasing Range of Motion and Function and Reducing Pain in Patients with Pelvic Injuries

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ABSTRACT: Inadequate physical preparation, improper posture while sitting or standing, prolonged activities without adequate rest such as long-distance walking, and excessive loading during physical activity or exercise may cause pelvic injuries, resulting in pain and restricted movement. Pelvic injuries can be managed through various approaches, including effleurage therapy combined with proprioceptive neuromuscular facilitation (PNF). This study aimed to evaluate the effectiveness of combined effleurage and PNF therapy in increasing range of motion (ROM) and movement function and reducing pain in patients with pelvic injuries receiving treatment at the Health and Sport Center of Yogyakarta State University (UNY). A pre-experimental one-group pretest-posttest design was used, involving 15 patients with pelvic disorders. Pain intensity was assessed using the Numeric Rating Scale (NRS), ROM was measured using a goniometer, and movement function was evaluated using the Harris Hip Score. Participants received a single approximately 30-minute session combining effleurage and PNF techniques. Pretest and posttest data were compared using a paired t-test or Wilcoxon signed-rank test, as appropriate. Pain intensity decreased from 7.0 ± 0.92 to 2.4 ± 0.91 (65%; $p = 0.000$). Flexion increased from 68.2 ± 11.7 to 120.8 ± 9.1 (77%; $p = 0.000$), extension from 13.8 ± 2.7 to 24.2 ± 4.0 (76%; $p = 0.000$), abduction from 18.1 ± 3.3 to 30.4 ± 5.0 (78%; $p = 0.000$), adduction from 11.2 ± 1.5 to 20.1 ± 1.2 (69%; $p = 0.000$), internal rotation from 16.6 ± 4.5 to 29.3 ± 4.6 (77%; $p = 0.000$), and external rotation from 26.4 ± 3.5 to 37.5 ± 3.9 (30%; $p = 0.000$). Movement function increased from 51.8 ± 7.8 to 75.1 ± 8.2 (45%; $p = 0.000$). These findings indicate that combined effleurage and PNF therapy is effective in reducing pain and improving ROM and joint movement function and may therefore be considered as a therapeutic approach for pelvic injuries.

KEYWORDS: effleurage, movement function, PNF, pain, range of motion.

I. INTRODUCTION

Physical activity and exercise frequently lead to musculoskeletal disorders and may result in injury. Inadequate physical preparation, improper posture while sitting or standing, prolonged activities without rest such as long-distance walking, and excessive loading during physical activity or exercise may contribute to injury. Injuries may result from impact or overuse, including strains, sprains, fractures, and contusions characterized by redness (rubor), swelling (tumor), pain (dolor), and increased temperature (calor) (Arovah, 2021, p. 2). The management and healing time of each injury vary according to its characteristics and duration, including chronic, subacute, and acute injuries (Fauzi & Priyonoadi, 2018). One of the joints commonly affected by injury is the hip joint. Hip disorders may arise from sports activities, daily activities, or accidents (Hernowo & Ambardini, 2019, p. 2). Hip injuries can occur because of factors that repeatedly load the hip, including exercise, but they may also occur during routine daily activities. Such injuries may occur in adolescents because of high levels of physical activity, in adults because of occupational demands, and in older adults because of declining muscle and ligament strength. The hip joint may become painful when loads are lifted without adequate preparation or with sudden movements. Hip injuries may also result from accidents or impacts from external objects (Ilham et al., 2023). Injury can cause discomfort manifested as pain. Hip pain may be associated with prolonged sitting or standing, causing discomfort in the pelvic region and potentially affecting multiple body systems, including the endocrine, urinary, reproductive, and digestive systems (Bradley, 2017, p. 1). Symptoms of hip disorders may limit range of motion (ROM) and joint movement function. Hip ROM assessment includes flexion, extension, abduction, adduction, internal rotation, and external rotation, which can be measured using a goniometer. Limitations in movement function can be assessed using the Harris

The Effectiveness of Combined Effleurage and PNF Therapy in Increasing Range of Motion and Function and Reducing Pain in Patients with Pelvic Injuries

Hip Score questionnaire. Observations conducted by the researchers at the Health and Sport Center, Yogyakarta State University, in July 2024 showed that: (1) 47 of 589 patients attending the center had hip injuries, representing approximately 12.5% of all patients; (2) among the 47 patients with hip injuries, 19 were women and 28 were men; and (3) based on field observations, public knowledge of massage therapy remained limited. Scientific developments continue to advance across all aspects of life, including pharmacological and non-pharmacological treatment methods. Non-pharmacological approaches include sports massage, shiatsu, Swedish massage, heat therapy, cold therapy, and others, each with its own advantages and limitations. Massage manipulation techniques include effleurage, petrissage, tapotement, friction, and skin rolling. In this study, effleurage massage was used for hip injuries. Effleurage is intended to relax muscles in injured body regions, including muscles affected by strains and sprains. It can be applied to various body regions and is commonly used at the beginning and end of massage sessions (Priyambada et al., 2021). Effleurage is applied using the hands and fingers to stroke the body with varying degrees of pressure. This technique may promote relaxation of tense or strained muscles without causing additional injury and may facilitate the restoration of normal muscle condition (Kurniawan & Ardani, 2021). However, when injury affects a joint or other body structure, massage alone may not fully restore the pre-injury condition. One approach to strengthening the hip joint after injury is Proprioceptive Neuromuscular Facilitation (PNF) exercise (Wanodyana & Ambardini, 2018). PNF is a form of stretching exercise known to improve joint ROM and has been described as a rehabilitation and pain-relief technique that acts through neuromuscular mechanisms by stimulating proprioceptors (Gunning & Uszynski, 2019). PNF exercise can improve muscle mobility and ROM (Nurul Fitri et al., 2023). One PNF exercise pattern involves three principal phases: an isometric contraction of the target muscle, a relaxation period, and passive stretching (Wardhani & Komalasari, 2024). PNF exercise is practical and may help strengthen injured joints (Graham, 2015). Effleurage manipulation and PNF exercises as post-injury joint-strengthening interventions have been investigated in several studies, including "The Effectiveness of Effleurage Massage and Cryotherapy in Reducing Pain Levels among Patients with Gastritis at the Jatinegara District Health Center, Jakarta, in 2022" (Salsabila & Mochartini, 2022), "Contribution of Effleurage and Petrissage Sports Massage Techniques to Reducing Post-Training Fatigue in Al Azhar Bengkulu Pencak Silat Athletes" (Lubis et al., 2023), "Effectiveness of Combined Effleurage Massage Therapy and PNF Exercise for Hip Injury Recovery" (Hernowo & Ambardini, 2019), and "The Effectiveness of PNF Versus Static Stretching on Increasing Hip-Flexion Range of Motion" (Gunning & Uszynski, 2019). Field observations and the literature indicate that hip joint injuries are common and may reduce hip movement function. To date, the effectiveness of combined effleurage therapy and PNF exercise has not been specifically investigated. Therefore, this study aimed to determine the effectiveness of combined effleurage and PNF therapy in increasing ROM and movement function and reducing pain in patients with hip injuries.

II. METHOD

This study used a pre-experimental one-group pretest-posttest design, in which all participants were assigned to a single group without a control group. Data collection and measurements were conducted before and after treatment with combined effleurage massage and PNF exercise to determine changes following the intervention. Purposive sampling was used to select participants according to predetermined considerations. The sample size was determined using a sample-size calculator based on the type of data to be analyzed. The t-test test family was selected because the study involved one pretest and one posttest without a control group, and the same-subject option was selected because only one treatment group was used. The sample size calculation assumed an effect size of 0.7 based on Adhyaksa (2020), a significance level of 0.05, statistical power of 80%, and a one-tailed test, yielding a minimum sample size of 15 participants. The collected data were analyzed using SPSS to evaluate treatment effectiveness. Normality was first assessed to determine whether the data were normally distributed, followed by either a paired t-test or the Wilcoxon signed-rank test, as appropriate.

III. RESULT AND DISCUSSION

A. Result

This study was conducted to determine the effect of combined effleurage and PNF therapy on pain reduction and improvements in ROM and movement function in patients with hip disorders. The sample consisted of 15 participants. A pre-experimental one-group pretest-posttest design was used, with participants forming a single group according to the study criteria. Data collection and measurements were performed before and after combined effleurage massage and PNF treatment to identify changes following the intervention. The normality test results for the combined effleurage and PNF treatment data are presented below.

The Effectiveness of Combined Effleurage and PNF Therapy in Increasing Range of Motion and Function and Reducing Pain in Patients with Pelvic Injuries

Table 1. Normality Test Results

Variable	Normality Test	
	Sig.	Conclusion
Pain	.001	Not normally distributed
Flexion	.075	Normally distributed
Extension	.345	Normally distributed
Adduction	.457	Normally distributed
Abduction	.669	Normally distributed
Internal Rotation	.126	Normally distributed
External Rotation	.291	Normally distributed
Movement Function	.439	Normally distributed

Table 1 presents the normality test results for the differences in the sample-group data following combined effleurage and PNF treatment. Most variables were normally distributed; however, pain scores were not normally distributed ($p < 0.05$).

After the normality test, inferential tests were conducted to evaluate the study hypothesis that combined effleurage and PNF therapy reduces pain and improves ROM and movement function in patients with hip disorders. Statistical decisions were based on comparison of the p-value with $\alpha = 0.05$. If $p < 0.05$, H_0 was rejected and H_1 was accepted; conversely, if $p > 0.05$, H_0 was accepted and H_1 was rejected. The inferential test results are presented below:

Table 2. Paired t-Test Results

Variable	Paired t-Test	
	Sig. (2-tailed)	Conclusion
Flexion	.000	Significant
Extension	.000	Significant
Adduction	.000	Significant
Abduction	.000	Significant
Internal Rotation	.000	Significant
External Rotation	.000	Significant
Movement Function	.000	Significant

As shown in Table 2, the paired t-test yielded significance values of 0.000, which were below 0.05. Thus, H_0 was rejected and H_1 was accepted, indicating statistically significant changes in ROM and movement function following combined effleurage and PNF therapy.

Table 3. Wilcoxon Signed-Rank Test Results

Variable	Wilcoxon Signed-Rank Test	
	Asymp. Sig. (2-tailed)	Conclusion
Pain	.000	Significant

As shown in Table 3, pain scores were not normally distributed; therefore, the Wilcoxon signed-rank test was used. The test yielded an Asymp. Sig. (2-tailed) value of 0.000, which was below 0.05. Thus, H_0 was rejected and H_1 was accepted, indicating a statistically significant reduction in pain following combined effleurage and PNF therapy. Pain perception decreased by 65%. ROM increased by 77% for flexion, 76% for extension, 78% for abduction, 69% for adduction, 77% for internal rotation, and 30% for external rotation. Hip movement function, measured using the Harris Hip Score, increased by 45%.

B. Discussion

This study investigated the effect of combined effleurage and PNF therapy on pain reduction and improvements in ROM and movement function in patients with hip disorders. The sample consisted of 15 participants. A pre-experimental one-group pretest-posttest design was used, with participants assigned to a single group according to the study criteria. Measurements were performed before and after combined effleurage massage and PNF treatment to determine changes following the intervention. The findings showed meaningful improvements in pain perception, ROM, and hip movement function as measured using the Harris Hip Score after combined effleurage and PNF therapy. Based on the analysis of pain perception and joint ROM, mean pain scores decreased from 7.0 at pretest to 2.4 at posttest, corresponding to an effectiveness of 65%. Mean flexion increased from 68.2° to 120.8° (77.0%), extension from 13.8° to 24.2° (76%), adduction from 11.2° to 20.1° (78%), abduction from 18.1° to 30.4° (69%), internal rotation from 16.6° to 29.4° (77%), and external rotation from 26.4° to 37.5° (30%). Hip movement function

The Effectiveness of Combined Effleurage and PNF Therapy in Increasing Range of Motion and Function and Reducing Pain in Patients with Pelvic Injuries

measured using the Harris Hip Score increased by 45%. These findings indicate meaningful improvements in joint ROM and pain perception following effleurage and PNF treatment and are consistent with the study “Effectiveness of Combined Massage Therapy and PNF Exercise Therapy for the Recovery of Chronic Hip Injuries” by Aditya Septian Nurcahya (2020), which reported a 67.24% reduction in pain and a mean 60.93% improvement in ROM. R. Permana Wijaya (2023), in the study “Effectiveness of Exercise Therapy Based on Loosening, Stretching, and Strengthening in the Management of Chronic Hip Disorders,” reported a significant 64% reduction in pain. Improvements in ROM were 29% for flexion, 76% for extension, 53% for abduction, 79% for adduction, 58% for internal rotation, and 33% for external rotation, while movement function improved by 46%.

IV. CONCLUSIONS

Based on the study findings and discussion, effleurage massage combined with PNF was effective in managing hip disorders. The intervention was associated with a significant reduction in pain and an increase in hip joint range of motion (ROM). The improvement in ROM was accompanied by better movement function, which may support patients’ functional activities. Therefore, combined effleurage massage and PNF may serve as an effective approach for improving functional outcomes in patients with hip disorders.

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The Effectiveness of Combined Effleurage and PNF Therapy in Increasing Range of Motion and Function and Reducing Pain in Patients with Pelvic Injuries

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