Effectiveness Of Frirage Massage Therapy And Exercise Therapy Improving Ankle Joint ROM After Chronic Ankle Injury In Futsal Athletes Jogokaryan Academy

Efektivitas Terapi Masase Frirage Dan Terapi LatihanDalam Meningkatkan ROM Sendi Pergelangan Kaki Pasca Cedera Engkel Kronis Pada Atlet Futsal Akademi Jogokaryan

Original Article

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Abstract.

Background Chronic ankle injury is a common problem among futsal athletes due to repetitive high-intensity movements and rapid changes of direction. This condition often results in limited ankle joint range of motion (ROM), functional impairment, and an increased risk of recurrent injury. Effective rehabilitation strategies that integrate manual therapy and therapeutic exercise are therefore essential to restore ankle function.

Objectives This study aimed to examine the effectiveness of a combined intervention consisting of frirage massage therapy and exercise therapy in improving ankle joint range of motion in futsal athletes with chronic ankle injury.

Methods A pre-experimental study with a one-group pretest–posttest design was conducted involving 11 futsal athletes with chronic ankle injury, selected using purposive sampling. Participants received a combined intervention of frirage massage therapy followed by exercise therapy. Ankle joint range of motion, including plantarflexion, dorsiflexion, inversion, and eversion, was measured using a goniometer before and after the intervention. Data were analyzed using paired sample t-tests or Wilcoxon signed-rank tests, depending on data normality, with a significance level set at $p < 0.05$.

Results The results showed significant improvements in ankle joint range of motion following the intervention ($p < 0.05$). Increases were observed in plantarflexion, dorsiflexion, inversion, and eversion ROM, with the greatest percentage improvement noted in eversion movement. These findings indicate that the combined intervention effectively enhanced ankle joint mobility in athletes with chronic ankle injury.

Conclusion The combination of frirage massage therapy and exercise therapy is effective in improving ankle joint range of motion in futsal athletes with chronic ankle injury. This integrated approach may serve as a practical and applicable rehabilitation strategy to support functional recovery and reduce the risk of recurrent ankle injuries.

Keywords: chronic ankle injury, frirage massage, exercise therapy, range of motion, futsal athletes

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INTRODUCTION

Sports injuries are a global problem that often occur in physically active individuals, both athletes and non-athletes, and can have a significant impact on motor function and daily activity performance. Sports with fast movements, sudden changes in direction, and high body contact, such as futsal, have a greater risk of injury to the lower extremities, especially the ankle joint [1][2][3]. Ankle injuries generally occur due to excessive inversion or eversion mechanisms, causing ligament damage and joint instability [4]. This condition often progresses to chronic ankle injuries if not treated appropriately and comprehensively.

Nationally, the high prevalence of lower extremity injuries in Indonesia indicates that ankle injuries remain an important health and sports issue [5]. Data from the 2018 Basic Health Research (Riskesdas) report that injuries to the lower limbs account for more than 60% of total injury cases, with the ankle being one of the most common injury sites [6]. Chronic ankle injuries not only cause pain and discomfort, but also lead to limited range of motion (ROM), decreased joint stability, and an increased risk of recurrent injuries that can hinder sports activities and daily functional activities.

Range of Motion (ROM) is an important indicator in assessing joint function and the success of the post-injury rehabilitation process. A decrease in ROM in the ankle joint can affect the ability to walk, run, jump, and maintain body balance [7][8]. Therefore, rehabilitative interventions aimed at restoring and improving ankle joint ROM are an essential component in the management of chronic ankle injuries. A rehabilitation approach that focuses not only on pain reduction but also on restoring joint biomechanical function is necessary to prevent long-term dysfunction.

Various rehabilitation methods have been developed to treat chronic ankle injuries, both through medical and non-medical approaches. Exercise therapy has been widely recommended as a key component in the rehabilitation of ankle sprains and chronic ankle instability because it can improve flexibility, muscle strength, joint stability, and ROM [9][10]. On the other hand, massage therapy, particularly frirage massage, which is a method unique to Indonesia, has been reported to be effective in helping to improve blood circulation, reduce muscle tension, and accelerate the recovery process of soft tissue after injury [11][12].

Although frirage massage therapy and exercise therapy have each been widely used in sports injury rehabilitation practice, scientific evidence regarding the effectiveness of combining these two interventions, particularly in improving ankle joint ROM in cases of chronic ankle injury, is still limited. Most previous studies have tended to examine the effects of exercise therapy or manual therapy separately, thus failing to provide a comprehensive picture of the synergistic potential of combining frirage massage and exercise therapy in the context of functional rehabilitation.

Based on these conditions, this study is important to examine the effectiveness of combining frirage massage therapy and exercise therapy in improving ankle joint range of motion in futsal athletes with chronic ankle injuries. This study is expected to contribute scientifically to the development of sport science-based rehabilitation interventions and provide an empirical basis for sports therapy practitioners in designing more effective and applicable ankle injury treatment programs.

METHOD

Research Design

This study employed a pre-experimental research design using a one-group pretest–posttest design to examine the effectiveness of combined frirage massage therapy and exercise therapy on ankle joint range of motion (ROM). This design was selected to evaluate changes in ROM before and after the intervention within the same group of participants.

Participants

The participants were futsal athletes from the Jogokaryan Futsal Academy who experienced chronic ankle injury. A purposive sampling technique was applied based on predefined inclusion and exclusion criteria. From a total population of athletes with chronic ankle injury, 11 participants met the eligibility criteria and were included in the study.

The inclusion criteria were: (1) futsal athletes diagnosed with chronic ankle injury, (2) experiencing limitations in ankle joint range of motion, and (3) willing to participate in the study. The exclusion criteria included: (1) acute ankle injury, (2) history of ankle fracture or surgical intervention, and (3) participants undergoing other concurrent rehabilitation programs.

Intervention Procedures

All participants received a combined intervention consisting of frirage massage therapy followed by exercise therapy. The frirage massage therapy was administered for 20 minutes, utilizing friction and effleurage techniques, complemented by traction and reposition maneuvers to reduce muscle tension, improve circulation, and restore joint alignment. Immediately after the massage session, participants performed exercise therapy for 10 minutes, focusing on ankle joint flexibility and mobility through range of motion exercises.

The intervention was conducted consistently for all participants by a trained therapist to ensure uniformity of treatment application.

Outcome Measures

The primary outcome measure was ankle joint range of motion (ROM), including plantarflexion, dorsiflexion, inversion, and eversion movements. ROM was measured using a standard goniometer, which is a valid and reliable instrument for assessing joint angular motion. Measurements were taken

before the intervention (pretest) and after completion of the intervention program (posttest) following standardized goniometric assessment procedures.

Data Analysis

Data were analyzed using descriptive and inferential statistical methods. Descriptive statistics were used to summarize participant characteristics and ROM values. Normality of data distribution was assessed prior to hypothesis testing. For normally distributed data, a paired sample t-test was applied, whereas the Wilcoxon signed-rank test was used for non-normally distributed data. All statistical analyses were conducted at a 5% significance level ($p < 0.05$) to determine the effectiveness of the intervention.

In addition, the level of effectiveness of the intervention was calculated by comparing the percentage improvement in ROM values between pretest and posttest measurements.

RESULTS AND DISCUSSION

Results

Participant Characteristics

A total of 11 futsal athletes with chronic ankle injury participated in this study. All participants completed the intervention protocol and were included in the final analysis. The participants exhibited limitations in ankle joint range of motion (ROM) prior to the intervention, indicating functional impairment associated with chronic ankle injury.

Descriptive Analysis of Ankle Range of Motion

Descriptive analysis demonstrated an improvement in ankle joint ROM across all measured movements following the combined frirage massage and exercise therapy intervention. Prior to the intervention, the mean ROM values indicated restricted plantarflexion, dorsiflexion, inversion, and eversion. Post-intervention measurements showed increased ROM in all directions of ankle movement.

The mean pretest ROM values were 34.73° for plantarflexion, 30.00° for dorsiflexion, 28.00° for inversion, and 14.73° for eversion. After the intervention, the mean posttest values increased to 43.45° for plantarflexion, 35.73° for dorsiflexion, 38.09° for inversion, and 23.18° for eversion.

Table 1. Pre-test Table for Range of Motion Measurement

PRETEST

	N	Minimum	Maximum	Mean	Std. Deviation
Plantarflexion	11	26˚	41˚	34,73	4.429
Dorsiflexion	11	21˚	38˚	30,00	5.568
Inversion	11	16˚	41˚	28,00	8.198
Eversion	11	5˚	37˚	14,73	8.650

Table 2. Posttest Table for Range of Motion Measurement

POSTTEST

	N	Minimum	Maximum	Mean	Std. Deviation
Plantarflexion	11	34˚	58˚	43,45	9.070
Dorsiflexion	11	30˚	43˚	35,73	3.901
Inversion	11	20˚	54˚	38,09	10.222
Eversion	11	11˚	55˚	23,18	12.797

Table 3. Average Data of Pre-test and Post-test Differences in Ankle Joint ROM

Data *Pretest* dan *Posttest*

	Pretest	*Posttest*	Difference	Percentage
Plantarflexion	34,73˚	43,45˚	8,72˚	25,10%
Dorsiflexion	30,00˚	35,73˚	5,73˚	19,10%
Inversion	28,00˚	38,09˚	10,09˚	36,03%
Eversion	14,73˚	23,18˚	8,45˚	57,36%

Normality Test Results

Normality testing indicated that plantarflexion, dorsiflexion, and inversion ROM data were normally distributed, whereas eversion ROM data did not meet the assumption of normality. Accordingly, parametric and non-parametric statistical tests were applied based on the distribution characteristics of each variable.

Table 4. Results of Ankle Joint ROM Normality Test

	Data	Sig.	Description
Plantarflexion	*Pretest*	0,756	Normal
	Posttest	0,054	Normal
Dorsiflexion	*Pretest*	0,366	Normal
	Posttest	0,898	Normal
Inversion	*Pretest*	0,143	Normal
	Posttest	0,948	Normal
Eversion	*Pretest*	0,016	Abnormal
	Posttest	0,017	Abnormal

Inferential Analysis

The results of the paired sample t-test revealed a statistically significant increase in ROM for plantarflexion, dorsiflexion, and inversion movements following the intervention ($p < 0.05$). For eversion ROM, the Wilcoxon signed-rank test demonstrated a significant difference between pretest and posttest measurements ($p < 0.05$).

These findings indicate that the combined intervention produced significant improvements in ankle joint ROM across all measured movement directions.

Table 5. Paired T-test Results

Data	Pretest	Posttest	Sig.	Keterangan
Plantarflexion	34,73	43,45	0,002	Signifikant
Dorsiflexion	30,00	35,73	0,002	Signifikant
Inversion	28,00	38,09	0,000	Signifikant

Table 6. Results of the Wilcoxon Signed Rank Test for ROM Eversion

Data	Variabel	N	Mean	Nilai Minimum	Nilai Maksimum	Nilai Z	Asymp. Sig (2 tailed)
Plantarflexion	Pretest	11	34,73	26	41	-2,938	0,003
	Posttest	11	43,45	34	58		
Dorsiflexion	Pretest	11	30,00	21	38	-2,805	0,005
	Posttest	11	35,73	30	43		
Inversion	Pretest	11	28,00	16	41	-2,937	0,003
	Posttest	11	38,09	20	54		
Eversion	Pretest	11	14,73	5	37	2,937	0,003
	Posttest	11	23,18	11	55		

Effectiveness of the Intervention

The calculated effectiveness levels showed percentage increases of 25.10% for plantarflexion, 19.10% for dorsiflexion, 36.03% for inversion, and 57.36% for eversion. These results suggest that the greatest improvement was observed in eversion ROM, while all movement components demonstrated clinically meaningful gains following the intervention.

Discussion

The present study demonstrated that the combination of frirage massage therapy and exercise therapy significantly improved ankle joint range of motion (ROM) in futsal athletes with chronic ankle injury. Improvements were observed across all movement directions plantarflexion, dorsiflexion, inversion, and eversion indicating that the intervention effectively enhanced joint mobility and functional capacity of the ankle. These findings support the role of integrated manual therapy and therapeutic exercise as a comprehensive approach in chronic ankle rehabilitation.

The observed increase in ROM aligns with previous studies emphasizing the importance of therapeutic exercise in restoring ankle mobility following chronic injury. [13] highlighted that rehabilitation programs incorporating range of motion exercises, strengthening, and neuromuscular training are essential to restore ankle function and reduce the risk of recurrent injury. Exercise therapy facilitates adaptive responses in muscles, tendons, and ligaments, leading to improved flexibility and joint stability [14]. In this study, the ROM-based exercise component likely contributed to gradual elongation of periarticular tissues and improved neuromuscular control of the ankle joint [15].

In addition to exercise therapy, frirage massage therapy may have played a crucial role in accelerating functional recovery [16]. Massage techniques such as friction and effleurage have been shown to improve local blood circulation, reduce muscle stiffness, and decrease pain perception by stimulating mechanoreceptors and modulating neuromuscular tension [12]. Improved circulation and reduced soft tissue adhesions following massage therapy may enhance tissue extensibility, thereby facilitating greater joint range during subsequent exercise sessions. This mechanism may explain the consistent ROM improvements observed across all ankle movement components in the present study.

Notably, the greatest percentage improvement was observed in eversion ROM, which is clinically relevant given that chronic ankle instability is often associated with deficits in lateral ankle control and peroneal muscle function [17]. Previous research has reported that limited eversion ROM and impaired

neuromuscular control increase susceptibility to recurrent ankle sprains [18][19]. The substantial improvement in eversion ROM observed in this study suggests that the combined intervention may effectively address functional deficits associated with chronic ankle instability, particularly those related to lateral ankle mechanics.

Compared to prior studies that primarily examined the effects of either exercise therapy or manual therapy independently, the present study provides evidence supporting the synergistic effect of combining frirage massage therapy with exercise therapy. While exercise therapy targets active tissue adaptation and neuromuscular re-education, massage therapy may optimize tissue readiness and joint alignment prior to exercise, resulting in a more effective rehabilitation stimulus. This integrated approach aligns with contemporary sport rehabilitation principles that advocate multimodal interventions to enhance clinical outcomes [20].

Despite these promising findings, several limitations should be acknowledged. The use of a pre-experimental design without a control group limits the ability to attribute improvements solely to the intervention. Additionally, the relatively small sample size may restrict generalizability of the results. Future studies employing randomized controlled designs with larger samples and longer follow-up periods are recommended to confirm the long-term effectiveness of combined frirage massage and exercise therapy in chronic ankle injury rehabilitation.

Overall, the findings of this study contribute to the growing body of evidence supporting integrated rehabilitation strategies for chronic ankle injury. The combination of frirage massage therapy and exercise therapy appears to be an effective and practical intervention for improving ankle joint ROM in futsal athletes, with potential applications in broader athletic and clinical populations.

CONCLUSION

The findings of this study indicate that the combination of frirage massage therapy and exercise therapy is effective in improving ankle joint range of motion (ROM) in futsal athletes with chronic ankle injury. Significant increases were observed across all ankle movement directions, suggesting that the integrated intervention contributes to enhanced joint mobility and functional recovery. The results highlight the potential benefit of combining manual therapy and therapeutic exercise as a comprehensive rehabilitation approach for chronic ankle injury. Frirage massage therapy may facilitate tissue readiness and reduce soft tissue restrictions, while exercise therapy promotes active adaptation of musculoskeletal and neuromuscular systems. This synergistic effect supports the application of multimodal rehabilitation strategies in sports injury management. From a practical perspective, the combined intervention used in this study can be considered a feasible and applicable rehabilitation program for sports therapists and practitioners, particularly in futsal and similar sports with high ankle injury risk. The approach may help accelerate functional recovery and reduce the likelihood of recurrent ankle injuries. Nevertheless, this study is limited by the absence of a control group and a relatively small sample size. Future research employing randomized controlled trials with larger samples and long-term follow-up is recommended to further validate the effectiveness of combined frirage massage and exercise therapy and to examine its impact on functional performance and injury recurrence. Overall, this study contributes empirical evidence to sport rehabilitation practice by supporting the use of an integrated massage and exercise-based intervention to improve ankle joint function in athletes with chronic ankle injury.

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AUTHOR CONTRIBUTION STATEMENT

The writing of this article involved roles in devising the research concept and design, reviewing and analyzing relevant literature, and drafting the overall manuscript.

CONFLICT OF INTEREST AND FUNDING

There is no conflict of interest

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