Effect Of Massage Manual Therapy And Kinesiotaping Towards The Reduction Of Swelling, Pain, And Improvement Of Motor Function In Ankle Injury

Pengaruh Terapi Manual Pijat dan Kinesiotaping terhadap Pengurangan Pembengkakan, Nyeri, dan Peningkatan Fungsi Motorik pada Cedera Pergelangan Kaki

Original Article

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Abstract.

Background Ankle injuries are common among athletes and physically active individuals, often resulting in swelling, pain, and limited motor function. Effective rehabilitation strategies are essential to accelerate recovery and restore functional performance. Manual massage therapy and kinesiotaping (KT) are widely applied therapeutic techniques believed to support healing and improve outcomes in musculoskeletal injuries.

Objectives This study aims to investigate the effect of manual massage therapy combined with kinesiotaping on swelling reduction, pain relief, and motor function improvement in patients with ankle injuries at Bengkel Terapi Masase Cedera Olahraga Mafaza.

Methods This research used a pre-experimental one-group pretest–posttest design. A purposive sample of 16 participants was selected from a population of 46 individuals with ankle injuries. The intervention consisted of 20 minutes of manual massage therapy combined with kinesiotaping. Swelling was measured using a tape measure, pain intensity was assessed using a Visual Analogue Scale (VAS), and motor function was evaluated with the Foot and Ankle Disability Index (FADI). Measurements were conducted before and after therapy. Data analysis employed a paired t-test to determine differences between pretest and posttest results.

Results The intervention significantly reduced swelling, pain, and improved joint function, with all outcomes showing a p-value < 0.001.

Conclusion Manual massage therapy combined with kinesiotaping is effective in reducing swelling, alleviating pain, and enhancing motor function in individuals with ankle injuries, and may be recommended as part of rehabilitation management.

Keywords: ankle injury, kinesiotaping, manual massage therapy

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INTRODUCTION

Injury or trauma is a physical disorder that can cause functional impairment in the affected limbs. Injuries may lead to musculoskeletal disruptions, which in turn can result in metabolic disorders, degenerative conditions, autoimmune diseases, infections, or idiopathic disorders with unknown causes [1]. Common symptoms of injury include pain and decreased mobility. The wound healing process following an injury is divided into several phases: the destructive-degenerative phase, the inflammatory phase, the regeneration or tissue repair phase, and the remodeling phase [2].

In general, injuries are classified into two categories: acute injuries, which occur suddenly, and chronic injuries, which develop gradually over time. When the body experiences an injury, it responds shortly after the trauma due to damage to the sarcolemma, which triggers a calcium influx. This process activates protease and hydrolase enzymes, resulting in muscle tissue damage [3]. Inflammatory responses are commonly characterized by symptoms such as dolor (pain), calor (heat), tumor (swelling), rubor (redness), and functio laesa (loss of function) [4]. The lower limbs serve as the main support for the body, thus bearing more weight and pressure than other body parts.

This weight-bearing role makes the lower extremities more susceptible to injury. One of the most frequently occurring lower extremity injuries is an ankle injury. According to [5], ankle injuries are the most common due to the joint's inability to adjust to sudden body movements and overuse. Musculoskeletal injuries are among the most prevalent conditions reported in emergency departments.

In Canada, ankle injuries account for 7.5% of emergency visits, with an incidence rate of 5 per 1,000 individuals [6].

Efforts to treat ankle injuries can be divided into pharmacological and non-pharmacological approaches. The most common pharmacological treatments include the use of non-steroidal anti-inflammatory drugs (NSAIDs) and acetaminophen to relieve pain [1]. Non-pharmacological management includes various techniques such as the PRICE principle, transcutaneous electrical nerve stimulation (TENS), acupuncture, occupational therapy, relaxation therapy, manual therapy, manual mobilization, and rehabilitation [7]; [8]. Several studies have found that widely used treatments include massage, elevation, early mobilization, compression, kinesiology taping, and electrical therapy to reduce swelling and pain caused by inflammation [9].

Massage therapy is a well-established therapeutic modality that has been used and developed for centuries across cultures worldwide. It dates back to the pre-Christian era and was introduced by Hippocrates, known as the father of modern medicine [10]. Massage has shown positive effects in reducing swelling, especially in cases of musculoskeletal injuries [11]. It helps to alleviate pain, normalize muscle or tissue tone, and improve the extracellular environment, thus supporting musculoskeletal mobility [10]. [12] stated that massage can serve as a manual technique for edema mobilization. The goal of manual massage is to facilitate lymphatic flow by gently stroking the swollen area in a proximal direction toward skin folds.

In addition to massage, kinesiology taping (KT) can also be used to reduce swelling [13]. KT has been shown to affect muscle tone, support joint function, and decrease edema by promoting lymphatic circulation through the lifting effect of the tape applied to the affected area [14]; [15]. According to [16], KT contributes to faster joint range of motion recovery and reduced swelling. If the inflammatory process can be properly monitored, tissue healing will become safer and more effective. Based on this background, the present study aims to further investigate the effectiveness of manual massage therapy and kinesiology taping (KT) in reducing swelling, pain, and improving functional movement in ankle injuries.

METHOD

Type of Research

This study utilized a pre-experimental research design with a one-group pretest-posttest model. This design was employed to assess the condition of the subjects prior to treatment (pretest) and after the intervention (posttest). The study was intended to examine the effects of manual massage therapy combined with kinesiotaping (KT) on reducing swelling and pain, and on improving motor function in individuals with ankle injuries.

Time and Location of Research

The research was conducted from January 20 to March 8, 2024, at the therapy unit of Bengkel Terapi Masase Cedera Olahraga (BTMCO) Mafaza, located at Jl. Veteran No.93, Warungboto, Umbulharjo District, Yogyakarta City, Special Region of Yogyakarta, 55164.

Population and Sample

The population in this study comprised patients who sought treatment at Bengkel Terapi Masase Cedera Olahraga (BTMCO) Mafaza with complaints of ankle injury, without bone fractures, and who experienced ankle pain and swelling. The sampling method used was non-probability sampling with purposive sampling, in which not all individuals had equal chances of being selected. During the study period from January 20 to March 8, 2024, a total of 46 patients with ankle injuries were recorded. Based on the inclusion criteria, 16 patients qualified to be included as research subjects.

Research Instruments

To ensure accurate and measurable data collection, the following instruments were used: measuring tape, Visual Analogue Scale (VAS), and Foot and Ankle Disability Index (FADI).

1. Measuring
   This tool was used to measure the circumference of the ankle affected by swelling due to injury. A standard, non-elastic, flexible tape with a sensitivity of 0.1 cm and a width of 1 cm was used. The measuring tape demonstrated excellent reliability with an intraclass correlation coefficient (ICC)

ranging from 0.92 to 0.99 ($p < 0.001$). These results suggest that manual measurement of lower extremity circumference is a reliable method for clinical practice (Bakar et al., 2017:176).

2. Visual Analogue Scale (VAS)
   Pain assessment in this study utilized the Visual Analogue Scale (VAS), which rates pain intensity on a 0–100 mm scale. VAS has been validated with a correlation coefficient of $r = 0.941$ and reliability of ICC = 0.97. Based on these results, VAS is considered a valid and reliable tool for pain measurement (Alghadir, Anwer, Iqbal, & Iqbal, 2018).
3. Foot and Ankle Disability Index (FADI)
   The Foot and Ankle Disability Index (FADI) is a patient-reported outcome survey designed to assess functional limitations related to foot and ankle conditions. FADI consists of a total of 26 items, divided into two subscales: 22 items related to activity and 4 items related to pain.

RESULTS AND DISCUSSION

Result

This study aimed to determine the effects of manual massage therapy combined with kinesiotaping (KT) on reducing swelling caused by ankle injuries in patients at Bengkel Terapi Masase Cedera Olahraga (BTMCO) Mafaza**.** Additionally, it examined the therapy's effect on pain reduction and motor function improvement in these patients.

a. Descriptive Analysis

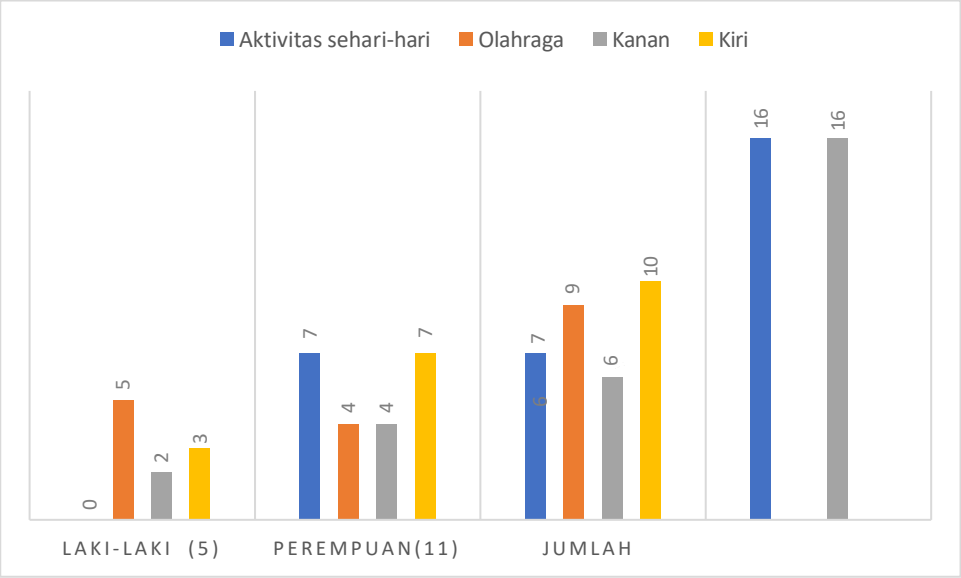
The research sample consisted of 5 male participants and 11 female participants.

Table 1. Research Sample by Gender and Side of Injury

Perlakuan	Cause injury		Side of Injured Ankle	
	Daily activity	Sports	Right	Left
KT & Massage	7	9	6	10
	16		16	
Male (5)	0	5	2	3
Female (11)	7	4	4	7
Total	7	9	6	10
	16		16	

Based on the table above, the number of female patients was greater than that of male patients. Females are at a higher risk of injury compared to males due to various extrinsic and intrinsic factors. Extrinsic factors include the type of sport, environment, skill level, and experience, while intrinsic factors include hormonal influences, anatomical structure, biomechanical alignment, and neuromotor control differences [17]. Regarding the injured side, the left ankle was the most commonly affected. A total of 10 participants experience injuries on the left ankle, while 6 were injured on the right side.

Figure 1. Histogram of Participants by Gender, Cause and Injured Ankle Side



b. Normality Test

A normality test was conducted as an initial step to determine whether the data were normally distributed. The results of this test guided the selection of the appropriate statistical analysis method. If the data were normally distributed, parametric tests were used; otherwise, non-parametric tests were applied. The Shapiro-Wilk test was used due to the sample size being fewer than 50 participants. A significance value (p-value) greater than 0.05 indicates a normal distribution, while a p-value less than 0.05 indicates a non-normal distribution.

Table 2. Normality Test Results

Variable	Significance (p)	Conclusion
Pretest swelling	0.225	Normal
Posttest swelling	0.087	Normal
48h Posttest) swelling	0.629	Normal
Pretest Pain	0.417	Normal
Posttest Pain	0.140	Normal
48h Posttest Pain	0.173	Normal
Pretest FADI	0.590	Normal
Posttest FADI	0.926	Normal

Based on the table above, the Shapiro-Wilk normality test results show that all variables have significance values greater than 0.05, indicating that the data are normally distributed.

c. Hypothesis Testing

Based on the normality test results, the data were found to be normally distributed. Therefore, further statistical testing was conducted using **a** paired t-test**.** The purpose of this test is to determine whether there is a significant difference between pretest and posttest measurements. The hypothesis is accepted if the significance value is less than 0.05; otherwise, it is rejected.

Table 3. Paired t-Test Results

Comparison	Sig. (2-tailed)	Description
Pretest Swelling – Posttest Swelling	0.000	Significant
Pretest Swelling – Posttest (48h)	0.000	Significant
Pretest Pain – Posttest Pain	0.000	Significant
Pretest Pain – Posttest Pain (48h)	0.000	Significant

Pretest FADI – Posttest FADI	0.000	Significant

Based on Table 3, the paired t-test results showed significance values of $p < 0.05$ for all variables. These results indicate that manual massage therapy combined with kinesiotaping in patients with ankle injuries significantly reduced swelling and pain and improved ankle joint function.

Discussion

Based on the hypothesis testing conducted using the parametric paired t-test, the results of this study demonstrate that manual massage therapy combined with kinesiotaping (KT) has a significant effect in reducing swelling and pain, as well as improving motor function in patients with ankle injuries.

These findings are consistent with studies conducted by [12]; [18], which show that massage therapy combined with KT has a statistically significant effect on reducing swelling. Moreover, this combination can reduce movement-related pain and enhance the joint function of the ankle following injury. Similarly, research by [19]; [16] confirmed that KT plays a role in reducing edema, relieving muscle tension, and improving functional movement in injured body parts.

[12] explained that massage therapy helps reduce swelling by mobilizing accumulated fluid in the affected area. Additionally, massage facilitates lymphatic drainage, enabling fluid that causes swelling to be absorbed by the lymphatic vessels, carried to the lymph nodes, and then returned to the circulatory system. Massage also produces a warming sensation and hydraulic effect, which stimulates a pumping action that influences muscle movement, increases blood vessel dilation, and improves lymphatic flow [20]. In addition, massage therapy may relieve pain through the Gate Control Theory [10]. Injuries may lead to excessive muscle tension caused by overstimulation, which activates the pain gate mechanism, resulting in painful sensations in the injured muscles. Manual massage therapy may also offer a calming and soothing effect.

Kinesiotaping (KT) provides a pulling effect on the skin, expanding the space between the dermis and fascia, thereby improving lymphatic flow and joint mobility [19]. According to Zein (2019:2–4), KT reduces pain via the Gate Control Theory by stimulating mechanoreceptors whose impulses are transmitted more quickly and intensely through beta fibers. These impulses inhibit the transmission of pain signals to the thalamus. KT lifts the skin, increasing interstitial space below the surface, reducing pressure and edema, and allowing more freedom of movement in the joint. This mechanism helps accelerate tissue healing in the presence of lymphatic obstruction and reduces swelling in the tissue [19].

The combined use of manual massage therapy and KT can reduce swelling by enhancing lymphatic drainage, allowing swelling to be better managed. Reducing interstitial swelling leads to decreased tissue pressure, which in turn helps alleviate pain. It also helps normalize muscle tone, reduce tension, and restore the extracellular matrix, thereby contributing to the recovery of the musculoskeletal system. Furthermore, both modalities reduce pain through the Gate Control Theory mechanism. From the results of this study, it can be concluded that the combination of manual massage therapy and KT has a significant effect in reducing swelling and pain, as well as improving joint function in individuals with ankle injuries.

CONCLUSION

The results of this study indicate that manual massage therapy combined with kinesiotaping has a significant impact on reducing swelling and pain, as well as improving ankle joint function. Subjects who received the manual massage intervention demonstrated a reduction in acute swelling, decreased pain, and improved motor function. These findings reinforce that the reduction of edema fluid due to injury can be accelerated through the application of manual massage combined with kinesiotaping. Manual massage helps reduce muscle tension and increase tissue flexibility, thereby promoting faster healing of the injured tissue. Kinesiotaping contributes to faster improvement in joint range of motion and reduction of edema. These findings are consistent with previous research, which also confirmed that the combination of these two methods is effective in supporting the healing process of tissue injuries, particularly in ankle sprains.

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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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