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Effectiveness of the combination of frirage massage and heat therapy to reduce the pain and increase range of motion of ancle after getting injury

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Abstract

Ankle injuries are often suffered by common people and athletes. This research aims to investigate the effectiveness of a combination of frirage massage and the heat therapy to reduce pain and increase the range of motion of the ankle after getting injury.

This study used a pre-experimental design with One Group Pretest-Posttest Design. The research population was the patients with chronic ankle injuries who came to Mr. Eko's Sports Injury Massage Therapy Clinic "Mafaza". The sampling technique used purposive sampling calculated by the Slovin formula and it obtained for about 20 samples. The research subjects received frirage massage treatment which was conducted for 20 minutes, followed by heat therapy for 10 minutes. The instrument used to measure the pain scale was based on the Visual Analogue Scale (VAS) and the joint space or Range of Motion (ROM) used the Goniometry. The data analysis technique used descriptive quantitative analysis, hypothesis testing used paired sample t-test to test normally distributed data, While Wilcoxon signed rank was used to test data that was not normally distributed with a significance level of 5%.

Based on the data, the results of this research indicate that the combination of frirage massage and heat therapy can significantly reduce the pain scale ($p < 0.05$) with an effectiveness of 51.87% and increase the Range of Motion (ROM) in the ankle significantly ($p < 0.05$) with an effectiveness of 52.2%. Based on these results it can be concluded that the combination of frirage massage and heat therapy is effective in reducing the pain and increasing the Range of Motion (ROM) after getting ankle injury.

Keywords: Frirage massage, heat therapy, pain, Range of Motion, and ankle injury

Introduction

Every person and athlete must carry out activities from light to heavy on a daily basis including physical activity, especially sports. In sports, we are always faced with the possibility of injury, and this injury will have an impact on physical activity, psychology and achievement. The possibility of injury that is often found in the community and athletes is in the lower extremities because the lower extremities are the dominant part compared to the upper extremities in carrying out physical activities. The ankle is one part of the lower extremity and is often injured. Ankle or ankle injuries can occur due to a sudden sprain in the lateral or medial direction which results in a sprain or tear of the ligament fibers in the ankle or ankle joint (Sumartiningsih, 2012) [7].

Ankle sprains are one of the most common injuries experienced by the athlete population, in the United States around 30% occur in sports injury cases. According to the history of injuries, almost half of the ankle sprains (49.3%) occurred when athletes were carrying out activities. Meanwhile, in football, ankle sprain is the second highest cause of injury after basketball. Gender, race, age and athlete activity significantly affect the incidence of ankle sprains (Waterman *et al.*, 2010) [9].

Data on the 2018 Riskesdas percentage of injuries nationally to the lower extremities is 67.9%. Other data states that in the DIY Riskesdas data for 2018 the percentage of ankle injuries was 64.52%. The most common types of injuries were bruises 56.12%, stab wounds 19.74%, sprains 36.10% and fractures 7.17%, limbs severed 0.51%. Ankle sprains are the most common of all acute musculoskeletal injuries that occur during physical activity.

Approximately 80% of acute ankle injuries occur by excessive inversion, with 77% resulting in lateral ligament sprains (Fong *et al.*, 2007) ^[4].

The ankle is formed by 3 joints, namely the talocrural joint, the subtalar joint, and the distal tibiofibular joint. The foot and ankle are very complex joint structures consisting of many bones, ligaments, muscles and tendons which function as stabilization and means of movement of the body. Muscles and ligaments are joint stabilizers, including sensorimotor (Kindler *et al.*, 2000) ^[6]. In the components of the foot and ankle joints, there will be plantarflexion, dorsiflexion, inversion and eversion movements. The function of the ankle as a body weight support allows injury to the ankle. Ligaments on the lateral side of the ankle include: the anterior talofibular ligament which functions to resist movement towards plantar flexion. The posterior talofibular ligament serves to resist motion towards inversion. The calcaneocuboideum ligament serves to resist movement towards plantar flexion. The talocalcaneus ligament that works to resist the movement towards inversion and the calcaneofibular ligament that works to resist the movement towards inversion (Chan, 2011) ^[4].

An ankle injury will result in limited ROM (range of motion) or limited joint motion which results in discomfort in carrying out daily activities. ROM limitation is caused by many factors including lack or imbalance of muscles and disruption of the normal function of the entire kinetic chain. Limitations in the range of motion of the joints are caused by pain, swelling, muscle spasms, muscle stiffness, joint contractures, and nerve damage, as well as increasing age (Wilson *et al.*, 2011) ^[10].

Not only are you feeling limited ankle ROM, but when you have an ankle injury, you will definitely feel pain when doing activities. Pain is an unpleasant sensory and emotional experience resulting from actual and potential tissue damage, which is painful to the body and expressed by the individual who experiences it. When a tissue is injured or damaged it results in the release of materials that can stimulate pain receptors such as serotonin, histamine, potassium ions, bradykinin, prostaglandins, and substance P which will result in a pain response.

Healing efforts made for pain disorders and decreased ROM can be in the form of pharmacological and non-pharmacological treatment. Pharmacological treatment is a treatment using drugs in healing joint, muscle or ligament pain, while non-pharmacological treatment is a treatment performed with various types of therapy such as: acupuncture, shiatsu, heat therapy, cold therapy, massage and others. One form of non-pharmacological treatment is massage therapy, one of which is sports injury therapy massage by the Ali Satia Graha method and heat therapy or thermotherapy.

In sports injury therapy massage the Ali Satia Graha method there are frirage massage techniques (friction and effleurage), pull or traction, and repositioning. The scouring or friction technique is useful for destroying myogilosis or piles of burning residue in the muscles. Effleurage is useful for improving blood circulation. Pulling or traction is useful to provide space for the two joints that experience joint shift errors and repositioning to be returned to their normal position without shifting between the two joints so that it will increase the range of ROM (Ali Satya Graha, 2015) ^[1].

Massage (massage) is one of the manipulation therapies primarily aimed at reducing pain and increasing joint flexibility (NI Arovah, 2009) ^[3]. Massage can relieve or at least reduce discomfort, stress, tension, and agony. For athletes and physical workers who are heavy, massage will be

able to help restore their ability to be able to do better activities the next day (Triah Retnoningsih 1, 2015) ^[8].

In massage, effleurage manipulation is the main or frequently used manipulation. Effleurage massage stimulation can stimulate the body to release endorphins which are natural pain relievers and stimulate nerve fibers that close synapses so that the transmission of pain impulses to the spinal cord and brain is inhibited. In addition, the gate control theory says that massage effleurage activates the transmission of larger and faster A-beta sensory nerve fibers. This process reduces pain transmission through small diameter A fibers and deltas.

Heat therapy or thermotherapy is the application of heat to the body to reduce symptoms of acute or chronic pain. This therapy is effective for reducing pain associated with muscle tension, although it can also be used to treat other types of pain. Thermotherapy or heat therapy is therapy using heat which is usually used in combination with other physiotherapy modalities such as exercise and manual therapy (N Arovah, 2010) ^[2].

Radiation of the body's response depends on the type of heat, heat intensity, duration of heat administration, and tissue response to heat. After the heat is absorbed in the body's tissues, the heat will be spread to the surrounding area. Heat can reduce pain through the gate control mechanism in which the sensation of heat which is transmitted through the C fibers obscures the perception of pain which is transmitted by the A-delta fibers or through increased endorphin secretion. Muscle stiffness caused by ischemia can be corrected by increasing blood flow to the area of inflammation. Heat therapy in the chronic phase works through several mechanisms, namely: increasing temperature, increasing metabolism, reducing pH levels, increasing capillary permeability, releasing histamine and bradykinin which result in vasodilation (N. Arovah, 2010) ^[2].

From the results of the explanation above, this study will test the effectiveness of a combination of massage and heat therapy to reduce pain and increase ROM (range of motion) in the ankle after an ankle injury.

Research methods

Types of research

The research design used in this study is Pre-experimental dengan desain one-group pretest-posttest design. The research subjects were divided into one group and then data collection and measurements were carried out before and after being given the combination treatment of massage and heat therapy with the aim of knowing whether there were changes experienced by the subject before and after being given treatment.

In the pretest, the research subjects were asked to measure the ankle pain scale using the Visual Analog Scale (VAS) and the ankle range of motion. Then the research subjects were given treatment in the form of frirage massage and heat therapy. After being given the treatment, the research subjects took the data or posttest by measuring the ankle pain scale using the Visual Analog Scale (VAS) and the ankle range of motion.

Time and Place of Research

This research was conducted on March 1 - 31 2021 of Therapy Massage Workshop for Sports Injuries Mr. Eko Mafaza Warungboto, Umbulharjo, and Yogyakarta.

Population and Research Sample

The population of this study were patients with ankle injuries in the chronic phase who live in the Special Region of Yogyakarta. Determine the population count of patients with

ankle injuries using data on the number of patients who came to Mr. Eko Mafaza's Therapy Massage Workshop for three months (Dec-Feb 2020) and obtained a population of 100 patients. Samples were taken by purposive sampling method which was then filtered using inclusion and exclusion criteria. Inclusion criteria: 1) Willing to become research subjects, 2) Male and female gender, 3) Ankle injuries that are more than three weeks old or chronic phase, 4) Still feel pain or discomfort when doing daily activities. Exclusion criteria: 1) Acute ankle injury, 2) Ankle is still inflamed or swollen, 3) There is an open wound, 4) Grade III sprain, 5) Fracture or broken bone.

Data Collection Instruments and Techniques

The instruments used in this study were a pain scale, namely the Visual Analogy Scale (VAS) and a goniometric tool to measure the range of motion (ROM).

A. Visual Analog Scale (VAS)

Examination of pain in the subjects of this study used a pain scale, namely the Visual Analog Scale (VAS) with a range of numbers from 0-10. Pain scale data collection was carried out by the subject himself by shifting or moving the signs on the Visual Analog Scale as a sign of pain intensity felt by the research subject. The greater the value of the designated pain scale, the greater the pain felt by the research subjects and vice versa. The smaller the pain scale value designated, the smaller the pain felt by the subject. The visual analogue scale research instrument has been tested for validity and reliability. The results of the validity and reliability tests were based on Kindler's research, *et al.* (2000)^[6] who compared the visual analog scale (VAS) with the state anxiety score of the Spielberger state-trait anxiety inventory (STAI) in patients undergoing surgery, showed that there was a relationship between VAS and STAI ($r = 0.66; p < 0.01$).

B. Goniometri

Another instrument used in this study was a goniometer which was used to measure the degree of joint motion performed by the researcher on the subject including measurements of dorsiflexion, plantar flexion, eversion, and inversion. The validity of the test is 0.97 and the reliability of the test is 0.51 (Hakiki & Kushartanti, 2019)^[5].

Data collection techniques as follows:

1. Subjects filled out a willingness to be researched
2. Provide an explanation of the flow of this research then explain about the massage therapy frirage and heat therapy that will be given.
3. Initial data collection or pre-test by measuring the ankle pain scale level with the VAS (visual analog scale) and measuring the ankle ROM (range of motion).
4. Subjects were given treatment in the form of massage frirage then combined with heat therapy in the form of infrared rays and finally traction and repositioning of the ankles were carried out.
5. After being given the treatment, the subject was asked to fill in the data after the treatment or post-test by filling in the level of the ankle pain scale with the VAS (visual analog scale) and measuring the ankle ROM (range of motion).
6. After obtaining the raw data from the research subjects, the data was processed using the SPSS application.

Data analysis technique

The research data that has been obtained will then be analyzed using several methods, namely:

1. Research Subject Descriptive Analysis

Descriptive analysis of the research subjects was used to find out the description of the research subjects which included data on gender, occupation, age, duration of injury, pain scale, and range of motion of the joints (ROM).

2. Descriptive analysis and research-related variable normality test

A. Associated Variable Statistics Descriptive

Descriptive statistics of the dependent variable of the study are used to describe the statistics of all the pre-test and post-test research variables which consist of the mean and standard deviation of the pain and ROM variables.

B. Normality test

This normality test aims to determine whether the research subject data is normally distributed or not normally distributed data which is analyzed by the Shapiro Wilk test. The data can be said to be normally distributed if the value is ($p > 0.05$), while those that are not normally distributed are if the value is ($p < 0.05$).

3. Inferential Statistical Analysis Test

A. Parametric Statistical Analysis

If the normality test shows that the data is normally distributed, then a paired sample t-test will be used to compare the pretest and posttest variables.

B. Non-parametric Statistical Analysis

Non-parametric statistical analysis test is used if the normality test shows that the data is not normally distributed, then a different test will be performed with the Wilcoxon signed rank test to compare the pretest and posttest variables.

4. Calculation of the level of effectiveness

To find out the level of activity is done by calculating the difference between the posttest (mean) and pretest (mean), then dividing the pretest value (mean) multiplied by 100%.

Research Results and Discussion

1. Description of Statistics and Research Subjects

This research was conducted on 20 subjects who were patients with ankle injuries at the Sports Injury Therapy Massage Workshop of Mr. Eko Mafaza in the Special Region of Yogyakarta who were given treatment of frirage massage and heat therapy. Total 20 subjects with details of 15 men and 5 women. The age range of the research subjects ranged from 20 - 38 years with an average age of 24.15 years. The average occupation in this study was as many as 13 students with a percentage of 65% and as many as 7 people as entrepreneurs with a percentage of 35%. The duration of injury in this study, which was injured in the range of 31-40 days, had a percentage of 50%. Duration of injury 21-30 days has a percentage of 30%. Duration of injury 41-50 days and 51-60 days has a percentage of 10%. The details of the data can be seen in the bar chart, as follows:

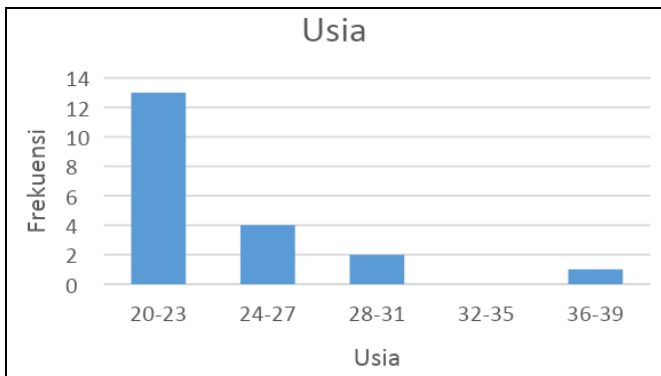


Fig 1: Show graph in Usia

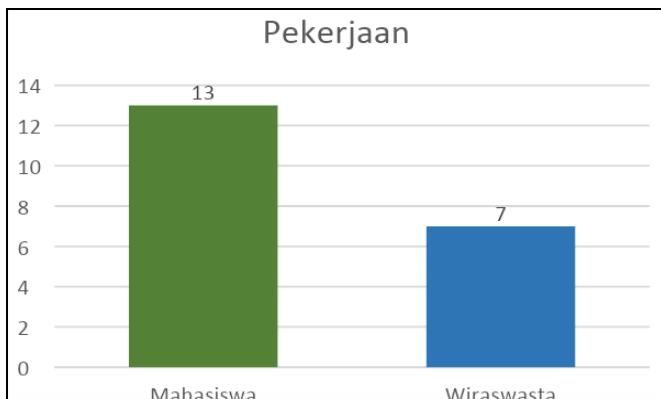


Fig 2: Show graph in Mahasiswa and Wiraswasta

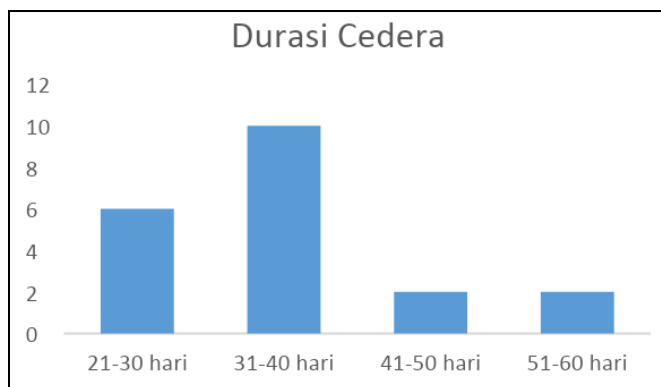


Fig 3: Show graph 21-30 hari, 31-40 hari, 41-50 hari and 51-60 hari

2. Statistical Description Analysis and Research Variable Normality Test

Determine the mean and standard deviation of pain and the range of motion in the ankle before and after treatment. The results of pain scale measurements using the VAS (Visual Analogue Scale) and the Range of Motion of the ankle in research subjects who were carried out before or pretest and after or posttest were given a combination treatment of frirage massage and heat therapy.

Variable	Pre-test		Post-test		Decline
	Mean	Std. Dev	Mean	Std. Dev	
Painful	6.65	0.988	3.2	1.056	3,45

A. Painful

Variable	Pre-test		Post-test		Enhancement
	Mean	Std. Dev	Mean	Std. Dev	
Dorsoflexia	11.75	1.888	18.15	1.631	6.4
Plantar flexi	21.95	3.561	30.7	4.219	8.75
Eversi	8.35	1.387	14.1	0.852	5.75
Inversion	16.85	2.796	24.55	3.103	7.7

B. Range of Motion (ROM)

The table above shows the mean and standard deviation descriptive statistics of pain and Range of Motion (ROM) before (pretest) and after (posttest) combination treatment of frirage massage and heat therapy. The pain table above shows a mean pretest of 6.65 and a posttest of 3.2. Then the standard deviation of the pretest is 0.988 and the posttest is 1.056. From the table above it can also be seen that there was a decrease in the pain scale from the pretest and posttest after being given the combination treatment of frirage massage and heat therapy of 3.45.

The ROM table above shows the mean pretest dorsiflexion 11.75 and posttest dorsiflexion 18.15 with a pretest standard deviation of 1.888 and a posttest standard deviation of 1.631. Then there is an increase in dorsiflexion ROM of 6.4. The mean plantar flexion pretest was 21.95 and posttest was 30.7 with a standard deviation of 3.561 pretest and 4.219 posttest. There was an increase in plantar flexion ROM of 8.75. The mean eversion pretest was 8.35 and posttest was 14.1 with a standard deviation of 1.387 pretest and 0.852 posttest. There is an eversion ROM increase of 5.75. Then the mean pretest inversion of 16.85 and posttest 24.55 with a standard deviation of 2796 pretest and 3103 posttest. There is an increase in inversion ROM of 7.7. So from the table above it shows that there is an increase in ankle ROM from the pretest and posttest after being given a combination treatment of frirage massage and heat therapy.

The next normality test was carried out to determine the distribution of the data. The data is said to be normal if $p > 0.05$ and abnormal if $p < 0.05$. Based on the Shapiro Wilk test, the normality test results can be seen in the table below.

No	Variable	P Value	Distribution	Test
1	Nyeri Pretest	0,019	Abnormal	Wilcoxon
2	Nyeri Posttest	0,009	Abnormal	
3	Dorsofleksi Pretest	0,130	Normal	Wilcoxon
4	Dorsofleksi Posttest	0,033	Abnormal	
5	Plantarflexi Pretest	0,991	Normal	Paired T-Test
6	Plantarflexi Posttest	0,537	Normal	
7	Overthrew the Pretest	0,307	Normal	Wilcoxon
8	Eversi Posttest	0,001	Abnormal	
9	Reverse Pretest	0,211	Normal	Paired T-Test
10	Inversi Posttest	0,289	Normal	

The results of the normality test in the table above show that in pain, dorsiflexion ROM, and eversion ROM pretest and posttest are not normally distributed, use the non-parametric test with Wilcoxon signed rank. Whereas in plantarflexion and inversion ROM the pretest and posttest were normally distributed, using the parametric test with the Paired T-Test.

3. Inferential Statistical Analysis

Testing the hypothesis in this study using statistical analysis Paired Sample t-Test for parametric data and Wilcoxon signed rank for non-parametric data. The hypothesis proposed in this study is a combination of massage and heat therapy to heal chronic ankle injuries. The hypothesis is accepted if the Asymp. Sign < 0.05 ($p < 0.05$), and the hypothesis is rejected if Asymp. Sign > 0.05 ($p > 0.05$). The results of this research data analysis are as follows:

A Parametric Statistical Analysis

ROM	Variable	Mean	Standard Deviation	Mean Different	Asymp. Sig (2 tailed)
Plantar flexi	Pretest	21,95	3,561	8,75	0,000
	Posttest	30,70	4,219		
Inversion	Pretest	16,85	2,796	7,70	0,000
	Posttest	24,55	3,103		

Testing the plantar flexion and inversion ROM data hypothesis using the Paired Sample T-Test presented in the table below.

The pretest plantar flexion ROM experienced by the subjects had an average of 21.95 and a standard deviation of 3.561. Posttest plantar flexion ROM has an average of 30.70 and a standard deviation of 4.219. The mean difference value shows the difference between pretest and posttest which is -8.75, which means there is a change in ROM after treatment. The significance value of plantar flexion ROM was 0.000 ($p < 0.05$).

The pretest inversion ROM experienced by the subjects had an average of 16.85 and a standard deviation of 2.796. Posttest inversion ROM has an average of 24.55 and a standard deviation of 3.103. The mean difference value shows the pretest posttest difference which is -7.70, which means there is a change in ROM after doing the treatment. The significance value of ROM inversion is 0.000 ($p < 0.05$).

Based on the table above, the results of statistical analysis using the paired sample t-test, the significance value of plantar flexion ROM is 0.000 and inversion is 0.000, the two significance values of the ROM are less than 0.05 ($p < 0.05$), so the hypothesis is accepted or it can be concluded that there is a significant difference pretest and posttest. This shows that the combined treatment of massage and heat therapy is effective in increasing plantarflexion and inversion ROM in patients with chronic ankle injuries.

B. Non-Parametric Statistical Analysis

The results of studying the hypothesis using the Wilcoxon signed rank test on pain scale data and dorsiflexion and eversion ROM are as follows:

1. Painful

Painful	Mean	Std. Dev	Min Value	Nilai Max	With	Asymp. Sig (2 tailed)
Pre-Test	6.65	0.988	5	8	-3,951	0,000
Post-Test	3.2	1.056	2	5		

Information

a. Posttest Pain < Pretest Pain
b. Posttest Pain > Pretest Pain
c. Posttest Pain = Pretest Pain

The range of the pretest movement pain scale experienced by the subjects was 5-8 with an average pain score of 6.65 and a standard deviation of 0.988. The difference in the standardized Z value of the posttest and pretest motion pain data is -3.951 (based on a positive rating), if the significant level used is 0.05 then the cumulative probability value of -3.951 is 0.000 (Asymp. Sig 2-Tailed) and ($0, 00 < 0.05$) then H0 is rejected and H1 is accepted.

Based on data on all subjects experiencing a decrease in the level of motion pain scale and through hypothesis testing being accepted, it can be stated that there has been a significant change between the pretest and posttest subject data scales or it can be concluded that the combination treatment of massage and heat therapy is effective in significantly reducing pain in chronic ankle injuries.

2. Dorsiflexion and Eversion ROM

ROM	Mean	Std. Dev	Min Value	Nilai Max	With	Asymp. Sig (2 tailed)
Dorsoflexia Pretest	11.7	1.888	9	15	-3,974	0,000
Dorsofleksi Posttest	18.1	1.631	15	20		
Overthrew the Pretest	8,35	1,387	6	10	-3,968	0,000
Eversi Posttest	14,1	0,852	13	15		

3. Information

To. Dorsofleksi Posttest < Dorsofleksi Pretest
b. Dorsofleksi Posttest > Dorsofleksi Pretest
c. Dorsofleksi Posttest = Dorsofleksi Pretest
d. Eversi Posttest < Eversi Pretest
e. Overturned Posttest > Overturned Pretest
f. Overturned Posttest = Overturned Pretest

Based on the table above, the results of statistical analysis using the Wilcoxon signed rank test, the pretest dorsiflexion ROM values experienced by the subjects were 9-15 with an average of 11.75 and a standard deviation of 1.888. Meanwhile, the posttest dorsiflexion ROM value experienced by the subjects was 18.15 and a standard deviation of 1.631. Standardized Z value -3.974 (based on negative ratings), if the significant level used is 0.05 then the cumulative probability value of -3.974 is 0.000 (Asymp. Sig 2-tailed) and ($0.00 < 0.05$) then H0 is rejected and H1 is accepted.

The subject's pretest eversion ROM was 6-10 with an average of 8.35 and a standard deviation of 1.387. While the posttest eversion experienced by subjects with an average of 14.1 and a standard deviation of 0.852. Standardized Z value -3.968 (based on negative ratings), if the significant level used is 0.05 then the cumulative probability value of -3.968 is 0.000 (Asymp. Sig 2-tailed) and ($0.00 < 0.05$) then H0 is rejected and H1 is accepted.

Based on the data the subject experienced an increase in ROM and through a hypothesis significance test of 2 variables, it can be stated that there was a significant change between the pretest and posttest subject data scales of 2 variables namely dorsiflexion and eversion ROM or it can be concluded that the combination treatment of massage and heat therapy is effective in increasing ROM dorsiflexion and eversion significantly in patients with chronic ankle injuries.

4. Effectiveness Calculation

Data	Pretest (Mean)	Posttest (Mean)	Effectiveness (%)
Painful	6,65	3,2	51,87%
Room Dorsiflexion	11,75	18,15	54,46%
ROM Plantarflexi	21,95	30,7	39,86%
ROM Eversi	8,35	14,1	68,86%
Inversion ROMs	16,85	24,55	45,69%

In the table above then the percentage value of the effectiveness of pain reduction was obtained by 51.87%. As for the calculation of ROM effectiveness, the percentage value of the effectiveness of increasing ROM was obtained for dorsiflexion of 54.56%, plantarflexion of 39.86%, eversion of 68.86%, and inversion of 45.69%. If the average is taken, the percentage of the effectiveness of increasing ROM in this study is 52.2%.

Conclusions and Recommendations

Conclusion

Based on the research results that have been obtained, it can be concluded that the combination of massage and heat therapy can effectively reduce pain significantly ($p < 0.05$), with an effectiveness of reducing pain by 51, 87% and significantly increased ROM ($p < 0.05$), with an effectiveness of increasing Rom of 52, 2%.

Suggestion

For Sufferers

Patients with chronic ankle injuries can use a combination of massage and heat therapy as a healing therapy in addition to other therapies.

For the Development of Sports Science

The results of this study can be used as a reference for the treatment of chronic ankle injuries.

For Further Researchers

This research can be developed with a larger sample size or by adding other variables.

Bibliography

1. Ali Satya Graha, dan SH. Efektifitas Terapi Masase Dan Terapi Latihanpembebanan Dalam Meningkatkan Range of Movementpasca Cedera Ankle Ringan. *Medikora*. 2015;12:1. <https://doi.org/10.21831/medikora.v0i1.4590>
2. Arovah N. Masase Dan Prestasi Atlet. *Jurnal Olahraga Prestasi*. 2010;6(2):116-122.
3. Arovah NI. Diagnosis dan Manajemen cedera olahraga. *Jurnal olahraga*; c2009. p. 1-11.
4. Fong DTP, Hong Y, Chan LK, Yung PSH, Chan KM. A systematic review on ankle injury and ankle sprain in sports. *Sports Medicine*. 2007;37(1):73-94. <https://doi.org/10.2165/00007256-200737010-00006>
5. Hakiki QS, Kushartanti BMW. Pengaruh Kompres Es Dan Kompres Hangat Terhadap Penyembuhan Cedera Ankle Pasca Manipulasi Topurak Pada Pemain Futsal. *Medikora*. 2019;17(2):136-144. <https://doi.org/10.21831/medikora.v17i2.29185>
6. Kindler CH, Harms C, Amsler F, Ihde-Scholl T, Scheidegger D. The visual analog scale allows effective measurement of preoperative anxiety and detection of patients' anesthetic concerns. *Anesthesia and Analgesia*. 2000;90(3):706-712. <https://doi.org/10.1097/00000539-200003000-00036>
7. Sumartiningasih S. Cedera Keseleo pada Pergelangan Kaki (Ankle Sprains). *Jurnal Media Ilmu Keolahragaan Indonesia*. 2012;2:2088-6802. <http://journal.unnes.ac.id/nju/index.php/miki>
8. Triah Retnoningsih HSS. Tingkat Keberhasilan Masase Frirage Terhadap Penanganan Range of Movement Cedera Ankle. *JSSF (Journal of Sport Science and Fitness)*. 2015;4(2):49-53.
9. Waterman BR, Owens BD, Davey S, Zacchilli MA, Belmont PJ. The epidemiology of ankle sprains in the United States. *Journal of Bone and Joint Surgery*. 2010;92(13):2279-2284. <https://doi.org/10.2106/JBJS.I.01537>
10. Wilson SM, Galantucci S, Tartaglia MC, Rising K, Patterson DK, Henry ML, *et al*. Syntactic processing depends on dorsal language tracts. *Neuron*. 2011;72(2):397-403. <https://doi.org/10.1016/j.neuron.2011.09.014>