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Febri Wijaya
Department of Sport Science,
Yogyakarta State University,
Yogyakarta, Indonesia

Wara Kushartanti
Department of Sport Science,
Yogyakarta State University,
Yogyakarta, Indonesia

Rachmah Laksmi Ambardini
Department of Sport Science,
Yogyakarta State University,
Yogyakarta, Indonesia

Enggista Hendriko Delano
Department of Sport Science,
Yogyakarta State University,
Yogyakarta, Indonesia

Frans File Manihuruk
Department of Sport Science,
Yogyakarta State University,
Yogyakarta, Indonesia

Murnianah
Department of Sport Science,
Yogyakarta State University,
Yogyakarta, Indonesia

Corresponding Author:
Febri Wijaya
Department of Sport Science,
Yogyakarta State University,
Yogyakarta, Indonesia

Effectiveness of manipulative therapy and heat therapy on pain reduction, increased range of motion and motion function in cases of low back pain

Febri Wijaya, Wara Kushartanti, Rachmah Laksmi Ambardini, Enggista Hendriko Delano, Frans File Manihuruk and Murnianah

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Abstract

Low back pain cases often occur in society and tend to be chronic so they require safe and effective treatment. The conduct of this study was shown to determine the effectiveness of manipulative therapy and heat therapy in reducing pain, increasing range of motion and function of motion in cases of low back pain. This type of research is pre-experimental with one group pretest and posttest design. The sample in this study were chronic low back pain patients who came to Pak Eko "Mafaza" massage therapy workshop who were selected through inclusion and exclusion criteria, the sample was obtained by calculating the Slovin formula. Subjects received manipulative therapy in the form of massage and stretching for 20 minutes, followed by hot compresses for 20 to 30 minutes. The instruments used were visual analogue scale to measure pain scale, modified schober test to measure range of motion and modified schober test to measure motion function. The analysis technique in this study uses quantitative descriptive analysis and hypothesis testing using paired sample t-test is shown to test normally distributed data, while Wilcoxon signed rank is shown to test data that is not normally distributed with a significance level of 5%. The results showed that Manipulative therapy and heat therapy can reduce the pain scale $p = 0.00$ ($p < 0.05$), increase the range of motion (ROM) $p = 0.00$ ($p < 0.05$), and significantly improve movement function $p = 0.00$ ($p < 0.05$), which means there is a significant effectiveness of manipulative therapy and heat therapy on pain reduction, increased range of motion (ROM), and motion function in patients with Low Back Pain (LBP).

Keywords: Manipulative therapy, heat therapy, pain, range of motion, motion function, low back pain

Introduction

The spine, especially in lumbar bones 1-5 which functions to support the upper extremity body and gives freedom to move upper extremity body parts, serves as a mediator of flexion, extension, lateral flexion and rotation movements. Each joint has an active range of motion, which is a movement that can be done by one individual independently, passive range of Motion is passive movement assisted by others according to the range of motion that can be done, and resisted range of motion is the range of motion of joints by fighting weights to assess musculoskeletal health.

The prevalence of upper extremity injuries is 32.7, with a prevalence of back injuries of 6.5%. In a study conducted by Cahya *et al* (2021), people with low back pain are complaints that have been experienced by 80% of the human population in the world. The results of observations in the field of low back pain (LBP) cases are still a common complaint, patients who visit the Pak Eko "Mafaza" Massage Therapy Workshop in the two-month period, namely in October and November, amounted to as many patients. 851 patients, patients who underwent low back pain (LBP) therapy accounted for 8.46% or 72 patients of the total injuries experienced by patients, most of the patients complained of pain when moving the waist while doing daily activities such as flexion movements.

Low back pain (LBP) is a heterogeneous condition that can arise from a variety of sources, including nerve injury, spinal cord compression, sprains, strains, inflammation or infection caused by daily habits, generally due to excessive and repetitive mechanical or physical loading or distortion (Dorsey & Starkweather, 2020)^[6].

The onset of low back pain (LBP) can be caused, among others, by static positions when working that are repetitive, and muscle tension (Syahrul Munir, 2012) [22]. Every year 15% - 45% of adults suffer from low back pain (LBP) and generally occurs at the age of 35-55 years (Natosba, 2016) [15]. Limitation of movement, pain, stiffness is the result of the emergence of low back pain (LBP) (Devi, 2014) [5]. The pain felt causes limited active range of motion, muscle stiffness, and autonomic dysfunction (Charoenpol *et al*, 2019) [3]. Pain arising in the body causes a person to have to rest and seek treatment which can lead to lack of productivity in work and incur costs for healing. Some of the groups of workers complain of low back pain, from that number around 5-10% become chronic complaints (Septadina & Legiran, 2014) [21]. Musculoskeletal pain can be treated through drugs (pharmacological) or without drugs (non-pharmacological). According to Nandar (2015) [14], pain management can be done without drugs such as therapeutic modalities including physical therapy, heat or cold, acupuncture, electrical therapy, psychological therapy. Heat therapy can be compresses, heat waves. Hot compresses are one type of heat therapy therapy that aims at pain relief, as revealed by Freiwald *et al* (2021) [18] in their research, namely giving hot compresses can relax muscle tension and can be used in dealing with pain. According to Goswami *et al* (2022) [10] in their research also mentioned that hot compresses can have a vasodilating effect on blood flow which relieves pain by relaxing muscles. Management of musculoskeletal pain can also be treated to manual therapy or manipulative therapy. Manual therapy or manipulative therapy is a physical treatment used by physical therapy, occupational and physiotherapy to treat musculoskeletal pain and disability. According to De Zoete *et al* (2021) [4] in their research, manipulative therapy is a physical treatment effort to overcome joint and soft tissue disorders whose main purpose is to mobilize, while according to Rubinstein *et al* (2019) [18] manipulative therapy is Passive movements are assisted by others so by pressing, pulling and moving. Masase and stretching are one form of manipulative therapy, both of which have good effects on the body's physiology including mechanical stimulation of tissues by the application of pressure and stretching rhythmically and reflective, mechanical effects (Yildiz *et al.*, 2020) [23]. According to Gasibat & Suwehli (2017) [9], massage treatment on the body can facilitate local blood circulation which results in pain relief, accelerate nutritional distribution, have a positive impact on nervous system activity, minimize the emergence of cortisol hormones, and can increase serotonin and dopamine hormones. The masase techniques revealed by Priyonoadi (2011, 8-15) include efflurage, petrissage, shaking, tapotement, friction, walken, and vibration. In the research of Kumar *et al* (2017) [12] Ayurvedic treatment was carried out with 6 sessions of heat pack application in the local area and a little standard massage and Ayu Prabaningtyas (2021) [16] giving core stability exercise for 3 times a week for months. Nakamura *et al* (2014) [13] revealed the benefits of stretching are increasing stamina, muscle strength, flexibility, can reduce joint pain, expand space, prevent low back pain (LBP), and improve appearance. According to Koesyanto *et al* (2014) [11] stretching is done to prepare and increase muscle flexibility so as to minimize position interference while at work. In research (Şahin *et al.*, 2018) [20] it was concluded in his research that rehabilitation combines medical therapy, exercise, and massage effectively for pain reduction.

Methodology

This type of research is pre-experimental with the form of research group pretest-posttest design. This research was carried out at the clinic Massage Therapy "Mafaza". The study was conducted from February to March 2021. sample size was 20 people with inclusion criteria. Pain measurement using visual analogue scale (VAS) application, range of motion using modified schober test and motion function of using modified oswentry disability index. Test normality using shapiro wilk. Normal distributed data will be tested using paired sample t-test, while data that is not normally distributed using Wilcoxon signed rank test to determine effectiveness with significance $p < 0.05$. data analysis using SPSS Version 22 software.

Result and Discussion

1. Description of Research Data

The pain value of manipulative therapy treatment and heat therapy showed an average decrease where the pretest pain value was 66.00 and standard deviation was 10.672, while the posttest value was 30.50 and standard deviation was 11.825, the range of motion (ROM) measurement value had an increase with a pretest mean value of 17.25 and a standard deviation of 0.716, while the posttest was 19.95 and a standard deviation of 1.146, and The motion function showed an increase in the average value of 21.10 and standard deviation of 2.654, while the posttest was 14.25 and standard deviation of 2.245.

Table 1: results of descriptive analysis of pretest and posttest data on pain, range of motion (ROM) and motion function

Descriptive Statistics					
Description	N	Minimum	Maximum	Mean	Std. Deviation
Pretest pain (mm)	20	46	86	66.00	10.672
Posttest pain (mm)	20	16	67	30.50	11.825
ROM pretest (cm)	20	16	18	17.25	.716
ROM posttest (cm)	20	18	22	19.95	1.146
Motion Function Pretest	20	17	25	21.10	2.654
Posttest Motion Function	20	11	19	14.25	2.245

2. Normality Test

Pretest-posttest data normality test on pain values, Range of motion (ROM) and motion function using shapiro wilk test with the following results:

Table 2: Data on Pretest-Posttest Normality of Pain, Range of Motion (ROM), and Motion Function

Tests of Normality				
Variable	Shapiro-Wilk		Information	Test
	Statistics	DfSig.		
Pretest pain (mm)	.970	20.754	Normal	Wilcoxon
Posttest pain (mm)	.886	20.022	Abnormal	
ROM pretest (cm)	.795	20.001	Abnormal	Wilcoxon
ROM posttest (cm)	.899	20.040	Abnormal	
Pretest Motion Function	.931	20.161	Normal	Paired t-test
Posttest Motion Function	.929	20.145	Normal	

Based on the table data above that the normality test results using Shapiro Wilk, show the results of the pain pretest data show sig values. $p > 0.05$ means normally distributed, posttest pain data shows Sig values. $p < 0.05$ which means not normally distributed, pretest-posttest range of motion (ROM) data

shows sig values. $p < 0.05$ which means the data is not normally distributed, and the motion function pretest-posttest data shows a Sig value of $p > 0.05$. Pain and range of motion data will be analyzed using non-parametric statistics through the Wilcoxon Signet Rank test.

3. Hypothesis Testing

Hypothesis testing in this study to determine the effectiveness of manipulative therapy and heat therapy on pain reduction, ROM improvement and motion function of LBP cases. With a value of $p = 0.000$ ($p < 0.00$) it means that there is a significant difference between pain data, ROM, and pretest-posttest motion function in patients with *Low Back Pain*. It can be concluded that manipulative therapy and heat therapy are effective in reducing pain, increasing ROM and improving movement function of *people with Low Back Pain*.

Table 1: Results of Non-Parametric Analysis of Pain Data and ROM Pretest-Posttest

Wilcoxon Signed Ranks Test		
	Posttest pain (mm) - Pretest pain (mm)	ROM posttest (cm) - ROM pretest (cm)
P Value	.000	.000

Table 2: Results of Parametric Analysis of Pain Data and ROM Pretest-Posttest

Paired Samples Test			
Pair 1	Pretest-Posttest Motion Function	Df	P Value
		19	.000

Pain is caused by interference with receptors called nociceptors, due to pain that arises can cause interference when going to perform movements in accordance with the range of motion (ROM) and motion function. Nociceptors are free nerve endings that are sensitive to painful external stimuli. While the stimulus of tissue injury and subjective experience of pain there are four processes, namely transduction, transmission, modulation, and perception. Pain occurs because of continuous mechanical loading that can stimulate pain caused by musculoskeletal disorders.

Masase is useful in improving the condition of the body both physiological and psychological. Masase can be done on a body that experiences fatigue, muscle stiffness, and joint pain. Mass treatment on the body can improve local circulation, so as to relieve pain, accelerate nutrient delivery, have a positive impact on nervous system activity, minimize the emergence of cortisol hormones, and can increase serotonin and dopamine levels (Field, 2016) [7]. Manipulative therapy in the form of Stretching is an activity that is highly recommended to start and end sports activities in order to minimize the occurrence of injuries, muscle stiffness during and after exercise.

According to (Nakamura *et al.*, 2014) [13] stretching done regularly can benefit the body such as Reduces muscle tension, improves blood circulation, reduces anxiety, feelings of pressure, and fatigue, improves mental alertness, reduces the risk of injury, makes the body feel better.

The effect of heat in reducing pain is explained by gate control theory. This theory suggests that there is a gate mechanism in the spinal cord that blocks pain signals by closing the gate system in the spinal cord. Heat increases pain threshold with increasing temperature, blood circulation, and metabolism and reduces muscle tension (Quinlan *et al.*, 2017) [17]. Arovah (2010) [1] revealed the physiological effects

masase can improve and Improves range of motion, muscle strength, coordination, balance and muscle function. Masase done with some movement manipulations such as eflurage, friction, walken and tapottement can stimulate tense nerves to relax. Heat fire in increasing range of motion (ROM) due to the physiological effects of heat therapy in reducing pain, namely by promoting muscle relaxation, improving circulation, promoting psychological relaxation and feelings of comfort (Kozier, 2018: 963-964) Pain will cause reduced movement function in patients with low back pain (LBP). stretching has Influence in reducing the level of pain complaints (Arroyo-Morales *et al.*, 2011) [2].

Conclusion

Based on the results of the research and the overall discussion in the research.

It can be concluded that: Manipulative therapy and heat therapy can reduce the pain scale $p = 0.00$, increase the range of motion (ROM) $p = 0.00$, and significantly improve motion function $p = 0.00$ ($p < 0.05$), which means there is a significant effectiveness of manipulative therapy and heat therapy on pain reduction, increase range of motion (ROM), and motion function in patients with Low Back Pain (LBP).

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