



Effect of Combined Therapy Manipulation on Upper Extremity Injury

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ABSTRACT

Aims In sports activities, the structure of the upper body plays a very important role and is often the target of various kinds of injuries that harm the body. This study aimed to determine the effect of combined therapy manipulation on upper extremity injuries.

Materials & Methods This experimental study with a randomized pre-test and post-test design was conducted on 60 people who experienced upper extremity injuries from February 14 to March 14, 2022. Subjects were divided into four groups, including three treatment groups (sports massage manipulation, trigger point manipulation, and chiropractic manipulation) and one control group. The treatment was carried out at the Gauging Massage Medical Manual Therapy practice in Yogyakarta. The degree of strain was measured using a Visual Analogue Scale. Multivariate Analysis of Variance was used to determine the effect of giving combined therapy manipulation on pain intensity in all groups of research subjects.

Findings The administration of the combined therapy manipulation significantly reduced the intensity of strain-induced pain in all treatment groups of sports massage, trigger point, and chiropractic compared to the control group ($p=0.001$).

Conclusion All combined massage manipulation groups, including sports massage, trigger point, and chiropractic can reduce pain intensity 15 minutes after treatment, and there is no significant difference between these three groups in reducing pain intensity.

Keywords Therapy; Injuries; Sport Massage; Trigger Point; Chiropractic

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Introduction

A healthy body is everyone's dream, both young and old. Health is a state of complete physical, mental and social well-being, not merely the absence of disease and infirmity or disability. By having a healthy body, all activities will run well and smoothly [1]. In the world of sports, the structure of the upper organs has a very important role, and often suffer from strain and sprain injuries caused by direct trauma such as falls, overuse, and collisions [2].

A literature study reported that there were upper extremity injuries in 545 patients (34%), inflammation in 404 injured patients (25%), fractures in 145 injured patients (9%), and contusions in 45 injured patients (3%). Tension and inflammation were highest in the shoulder and elbow, contributing to 405 injuries (71%) in the shoulder and 257 injuries (52%) in the elbow. Fractures and contusions were highest in the hand and wrist, contributing to 126 injuries (55%) to the hand and 33 injuries (30%) to the wrist [3].

The most commonly used massage therapy is manual therapy, which is an active technique that involves the application of accurately and precisely determined manual forces applied to the body to increase flexibility in restricted areas in joints, tissues or in skeletal muscles [4]. Manual massage has been used for rehabilitation and relaxation for thousands of years around the world. Manual massage can be defined as the mechanical manipulation of body tissues with rhythmic pressure and stroking for the purpose of promoting health and well-being [2]. In one study, combined therapy was more effective than massage alone in enhancing physiological actions [5]. Combination therapy showed a significantly more effect in reducing pain perception (45%-51%), increasing pain pressure threshold (15%-25%), and increasing tissue blood flow (131%-152%) than massage therapy without combined [6].

The advantages of each of the 3 combined massage techniques are: (1) Sport massage serves to overcome fatigue, prevent injury, stretch muscles, speed up recovery time, and treat injuries such as sprains, chronic pain, and limited range of motion, (2) Trigger point massage serves to reduce chronic pain that affects joints and nerves in the muscles, and (3) Chiropractic massage serves to normalize or restore joint function and stretch muscles. Finally, the effectiveness of handling hand and arm injuries is maximized and it only takes 1-3 treatments. Disorders that can be overcome such as; tennis elbow, lateral epicondylitis, carpal tunnel syndrome, rotator cuff, joint dislocation, and myofascial pain syndrome [7].

Valid and reliable pain assessment is essential for clinical trials and effective pain management. In acute pain trials, baseline pain assessment should

ensure sufficient pain intensity for the trial to detect a meaningful treatment effect [8]. Acute pain is a short-term sensation that alerts us to an injury. Meanwhile, the assessment of chronic pain and its effect on physical, emotional, and social functioning requires multidimensional qualitative tools and health-related quality of life instruments [9]. Chronic pain is pain that lasts more than three months. Your nervous system receives constant aches and pains signals from the body for months and even years.

Three of the most common and accurate outcome measure tools used by physical therapists to measure pain are the visual analogue scale (VAS), the numerical pain rating scale, and the McGill pain questionnaire. In this study the authors used a visual analogue scale for measuring acute and chronic pain. The VAS is considered by some to be one of the best measures of pain intensity [10].

This study aimed to determine the effect of combined therapy manipulation on upper extremity injuries.

Materials and Methods

In this research, an experimental method with pre-test and post-test design was used in a random group with a control. The number of research samples was 60 people who experienced upper extremity injuries from February 14 to March 14, 2022. The inclusion criteria were 18-40 years of age and having a normal Body Mass Index (BMI). Individuals who experienced muscle injuries in the upper extremities (hands, shoulders, elbows, and back) were excluded from the study.

Visual Analogue Scale (VAS)

The VAS is a self-reported measurement consisting of a vertical or horizontal line with an extreme anchor from no pain to extreme pain [11]. This line represents a continuum of pain intensity and is most often 10 cm long. Patients were asked to mark the level of pain intensity they felt for a certain period of time on a line. The examiner assesses the instrument by measuring the distance, in millimeters, from the "painless" anchor to the mark, which the patient identifies as the level of pain. The simplicity of its construction and use is considered the main advantage of VAS. The VAS is generally considered a valid and reliable tool for the measurement of chronic pain. Although it appears to be equally valid in the measurement of acute pain. The findings of the study indicate that the VAS is a very reliable instrument for measuring acute pain [12].

Combined pre-therapeutic protocol

Research subjects in the treatment and control groups underwent conditioning for one week. This conditioning was in the form of directions not to take drugs, and not to do strenuous activities. The research subjects were 60 injured patients consisting of 15 shoulder injuries, 15 elbow injuries, 15 wrist injuries, and 15 hand & finger injuries. The

treatment was carried out at the Gauging Massage Medical Manual Therapy practice in Yogyakarta. The treatment was carried out two times a week with a break of 3 days after the treatment. The selection of 2 times for one week of treatment refers to research conducted by Daub [13].

In the implementation of combined therapy treatment, the procedures carried out are (1) Observation to see the anthropometry of body shape; (2) Manual palpation for bone fractures; (3) Medical diagnosis by MRI or X-ray; (4) Pain test and measurement by Visual Analogue Scale (VAS); (5) Joint degree test and measurement by Range Of Motion (ROM); (6) Hand and arm function test and measurement by Disabilities of the Arm, Shoulder and Hand (DASH); (7) Sport massage healing protocol: effleurage, petrissage, clapping, spray, stretch, release, reposition, and traction; (8) Trigger point healing protocol; (9) Chiropractic healing protocol; (10) Duration 15-45 minutes the longest time; (11) Patient education after each healing treatment.

Combined therapy protocol

For the treatment group, namely the first, second, third, and fourth groups, the subject was given combined therapy manipulation treatment on the upper extremities, with details of the combined therapy manipulation treatment as follows:

- 1) Group K1 with manipulation of sports massage on the deltoid muscle, triceps brachii muscle, biceps brachii muscle, and brachioradialis muscle with a duration of 20 minutes;
- 2) Group K2 with manipulation of trigger points on the deltoid muscle, triceps brachii muscle, biceps brachii muscle, and brachioradialis muscle with a duration of 20 minutes;
- 3) Group K3 with chiropractic manipulation of the deltoid muscle, triceps brachii muscle, biceps brachii muscle, and brachioradialis muscle with a duration of 20 minutes;
- 4) Group K4 was not given combined therapy manipulation treatment (control group).

Pain measurement

The intensity of pain that arises was measured after 15 minutes with the Visual Analogue Scale (VAS), where 0 represents no pain, and 1-10 describes the level of intense pain.

Statistical analysis

Multivariate Analysis of Variance (MANOVA) was used to determine the effect of giving combined therapy manipulation on pain intensity in all groups of research subjects.

Findings

Table 1 presents the frequency of upper extremity injuries treated, including shoulder, elbow, wrist, hand and finger injuries.

The four studied groups did not differ significantly in terms of average weight and average BMI and were homogeneous (Table 2).

Table 1) Frequency of upper upper extremity injuries injuries treated, including shoulder, elbow, wrist, hand and finger injuries

Type of injury	Number of patients
Shoulder	
Rotator cuff injury	5
Dislocation	5
Frozen shoulder	5
Total	15
Elbow	
Elbow hyperextension	4
Muscle tension	4
Ligament/tendon tears	4
Dislocation	3
Total	15
Wrist	
Bone fracture	7
Sprains/tensions	8
Total	15
Hands and fingers	
Hyperextension finger	5
Sprained finger	5
Ligament/tendon tears	5
Total	15

Table 2) Comparison of the meanss of age, weight, height and BMI in the studied groups

Variable	K1 (n=15)	K2 (n=15)	K3 (n=15)	K4 (n=15)	P
Age (year)	19.05±0.75	20.04±0.52	22.00±0.91	20.05±0.52	0.007
Weight (kg)	64.10±3.13	67.00±3.38	66.20±3.40	61.50±3.72	0.902
Height (cm)	1.69±0.03	1.70±0.02	1.69±0.05	1.69±0.03	0.027
BMI (kg/m ²)	21.50±1.13	22.05±1.09	21.58±1.15	21.37±0.83	0.776

K1: Sports massage treatment group;

K2: Trigger point treatment group;

K3: Chiropractic treatment group;

K4: Group without treatment

In all groups, the administration of combined treatment had a significant effect on pain intensity ($p=0.001$; Table 3).

Table 3) Examining the mean pain intensity of the treatment and control groups using the MANOVA test

Group	N	Pain intensity	Normality test	Homogeneity test	P
K1	15	2.27±0.76	0.315	0.860	0.001
K2	15	1.52±0.84	0.326		
K3	15	2.21±0.84	0.315		
K4	15	3.80±0.76	0.315		

K1: Sports massage treatment group;

K2: Trigger point treatment group;

K3: Chiropractic treatment group;

K4: Group without treatment

The mean of pain intensity showed that all combined massage manipulation groups, including sports massage, trigger point, and chiropractic, can reduce pain intensity, and the most effective in reducing pain intensity is as follows: trigger point, chiropractic, and sports massage.

Discussion

In general, the mechanism of action of combined therapy in reducing pain intensity is to carry out three treatment steps, including sports massage,

trigger points, and chiropractic. Pain intensity is an indication of wound healing. Muscle damage or exercise-induced muscle damage that occurs due to exercise activity is a common thing that often occurs due to the increasing intensity or duration of exercise [14, 15]. Muscle damage is a manifestation of the failure of the balance between stress and response. Failure at the atomic level causes damage at the molecular level, which then causes damage at the cellular level and causes damage at the tissue level [16].

Strain is an injury that occurs in the tendon due to the use or excessive stress, after a traumatic injury or sports injury [17]. Hand and arm injuries often occur due to the use or excessive pressure on the muscles so that the muscles stretch beyond their normal capacity, overuse of muscles and being performed repeatedly, muscles being pulled in the wrong direction, excessive muscle contractions, or they occur when the muscles are not ready for contraction in the deltoid muscle, triceps brachii muscle, biceps brachii muscle, and brachioradialis muscle [18]. This trauma also directs the joint to the bone, causing the joint to shift into an immovable joint position.

Some types of exercise can damage muscle fibers, especially the exercise with eccentric muscle contractions [19]. Muscle pain with loss of function is commonly known as Delayed Onset of Muscle Soreness (DOMS) [20]. Pain is the body's defense mechanism that will appear if there is damaged tissue [21]. Pain receptors are scattered in the skin, where pain receptors respond to stimulation. The results obtained in the control group (K4) showed the highest mean pain intensity compared to the manipulation treatment group of sports massage (K1), trigger point (K2), and chiropractic (K3). This shows that the combined therapeutic manipulation of sports massage manipulation (K1), trigger point (K2), and chiropractic (K3) can reduce pain intensity, where the sports massage manipulation treatment group (K1) shows the lowest average number among the other groups.

Each combined therapy manipulation is indicated to reduce pain. Physiological effect of combination therapy reduces pain even though it is influenced by hormonal and nervous systems [22]. This happens because the receptors or nerves that receive stimuli under the skin are sensitive to stimulation in the form of pressure touch found in the combined therapy technique. The effect of massage will bring up a distraction that can increase the formation of endorphins and make muscle relaxation. From the point of view of physiology, massage is an engineering activity of the venous pump mechanism and the lymph pump, which can artificially accelerate recovery by accelerating circulation in conditions of complete rest or lying relaxed [13, 23]. When the muscle contracts, the veins and lymph vessels in and around the muscle are pinched, so

that blood and lymph are squeezed out of the vessel; then upon relaxation, the vessels are refilled with blood and lymph from the active muscle tissue, not the blood and lymph that had been squeezed out earlier [24, 25].

Based on the MANOVA test, there was a significant difference between the control group and the manipulation treatment groups of sports massage, trigger point, and chiropractic. This indicates that the decrease in pain intensity is influenced by the manipulation of sports massage, trigger point, and chiropractic, and manipulation of the trigger point has the best effect on reducing pain intensity. In general, the administration of combined therapy manipulation is a form of effort to reduce pain because of physical work on muscles that are experiencing tension [26]. This study also proved that the use of combined therapy reduces recovery time and can significantly prevent DOMS pain [27]. This also confirms that exercise has a negative effect, especially if it is done with excessive intensity, namely the damage to muscle fibers which is indicated by abnormal muscle function and decreased muscle strength [14, 28].

Based on the results of the research and the theory described above, the researcher believes that combined therapy manipulation can reduce the perception of pain in the hands. The three combined therapeutic manipulations, sport massage, trigger point, and chiropractic, have a good impact on reducing pain perception, and the trigger point manipulation has the best influence. This is in line with the opinion which states that combination therapy shows a significantly more effect in reducing pain perception (45%-51%), increasing pain pressure threshold (15%-25%), and increasing blood flow (131%-152%) than massage therapy without combination ($p < 0.001$) [6].

The benefits of combined therapy are that it can relieve muscle tension and stiffness, faster healing of strained muscles and sprained ligaments, reduced muscle pain, swelling, and spasms, greater joint flexibility, and range of motion, and subsequently improved athlete performance [5]. Massage can also increase muscle blood flow and lactate clearance while lowering creatinine kinase levels [9].

Sports massage: Usually works on one problem area, therapists work according to the athlete's needs and type of sport, often assist in the prevention and treatment of injuries (chronic pain, limited range of motion), and treatments designed to help prepare an athlete for an event and to help him recover. Sports massage is usually widely used for the prevention and treatment of injuries such as sprains, chronic pain, and limited range of motion in athletes [29].

Trigger point massage: This massage focuses on trigger points or areas of tense muscle fibers that can build up in the muscles of the body after injury or overuse. This knot is painful when pressed and can cause symptoms elsewhere in the body. Trigger

point massage is usually widely used to reduce chronic pain that affects joints and nerves in the muscles in the general population [30].

Chiropractic massage: This is a bone manipulation massage technique that focuses on the relationship between major body structures, such as the skeleton, muscles, and nerves, and the patient's health [31]. This massage is widely used to treat chronic pain in the upper body, such as the low back, back, neck, shoulders, hands, and arms. Chiropractic massage is usually widely used to normalize or restore joint function and stretch muscles in athletes and the general public [20].

Based on the results of existing research, there are still some limitations, so further research is needed on a larger sample, on each independent variable, namely the manipulation group of sports massage, trigger point, and chiropractic so that the physiological effects will be more pronounced. In addition, it is necessary to do a comparison test on each manipulation group from the combined therapy with the untreated group and with the treatment group with complete manipulation.

Conclusion

All combined massage manipulation groups, including sports massage, trigger point, and chiropractic can reduce pain intensity 15 minutes after treatment, and there is no significant difference between these three groups in reducing pain intensity.

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