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The Effectiveness of Sport Massage On Recovery In Athletes: Literature Review

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Abstract
Sports injuries are the most common problems experienced by athletes. Sports massage is non-invasive, easy to apply and does not cause side effects. The aim of this study was to determine the effectiveness of sports massage in athlete recovery. This study used a literature review approach. A literature review is a comprehensive analysis (not just a summary) of scientific documents directly related to a research question. A literature review was carried out using PICO searches in several databases such as Google Scholar and Elshiver. Criteria were met in 6 reviews that reported sports massage performed 3 times a week for 4 weeks for 20 minutes with moderate pressure (2 cm depth). Of the several articles found, most used RCTs, quasi-experimental study designs and clinical trials with $P<0.05$. Both the experimental and control groups received sports massage. It can be concluded that sports massage is effective in speeding up the athlete's recovery process.

Keywords: athlete, injury, recovery

INTRODUCTION

Sports achievement is also a metric that can be used to directly identify the state or level of success or achievement in a sport. Good performance is also supported by good performance. One of the causes of poor human performance is fatigue (Giriwijoyo & zafar Sidik, 2010).

Massage today is considered the most effective way to relieve fatigue and pain after exercise. To be fit and healthy, you need many services, including massage. There is evidence that massage is currently performed by several groups around the world. Archaeologists have found artifacts showing the use of massage in some parts of the world. Although there is no direct prehistoric evidence explaining the use of massage for medical purposes, circumstantial evidence clearly shows a relationship between massage and medicine (Graha & Priyonoadi, 2009).

Massage is an activity that targets human physical needs (Trofa et al., 2020). Judging by the way these activities are conducted, many services may be available (Pemberton et al., 1931). The general public and people with disabilities can also receive massage services. Given today's busy lifestyle, people really need massage services for their own care (Fadli & Widianingsih, 2021).

If you look at the lifestyle of people who work in offices, generally they have a low level of physical activity and need these services, especially those who are physically active such as athletes

and workers (coolers) (Siregar et al., 2024). From these factors, a person's health status can also be known (Fröberg et al., 2023). Sports activities have many benefits for the body, such as for health, maintaining physical fitness, and improving physical fitness. Achievements in sports.

Running is a popular sport in the community. However, like any other sport, running can cause muscle fatigue. Fatigue negatively affects performance, especially in athletes. Rapid activation of glucose breakdown and increased concentration of hydrogen ions (H) lead to muscle acidosis, leading to decreased performance.

Fatigue is also affected by energy levels of adenosine triphosphate (ATP) and calcium. During submaximal to high-intensity exercise, ATP formation occurs through anaerobic glycolysis as muscles contract under anaerobic conditions. It increases lactic acid levels in the blood and muscles. Recovery from fatigue is an important aspect of a fitness program. Recovery is the stage where your body returns to its pre-game condition. The recovery phase also involves restoring energy reserves, glycogen storage, myoglobin oxygenation, and removal of lactic acid from the blood and muscles. Lactic acid levels increase during intense exercise due to very high energy requirements, up to 100 times higher than at rest.

Under anaerobic conditions, metabolism produces two ATPs and lactic acid as byproducts. Athletes who do heavy physical activity must experience muscle damage (Akbar et al., 2022). Fast recovery is especially important for athletes who do high-intensity exercise in many sports. The human body is designed to adapt to conditions that allow organs and body systems to function properly and in balance, ensuring the internal balance necessary for life. This functional work occurs when several organs function more or less. Today, athletes in many sports that require high training intensity are required to perform some difficult exercises every day.

Continuing to train and compete in this way can have an impact on an athlete's athletic performance (Amann et al., 2013) (Taylor et al., 2019). When doing sports activities, muscles get tired quickly and symptoms of fatigue appear. This activity is closely related to the accumulation of metabolic waste in the body. When cells are under high pressure, they don't have enough oxygen to break down glucose, so when oxygen is low, the glucose that is broken down starts producing lactic acid. Increased lactate levels at the beginning of exercise can reach maximum along with the increase in exercise intensity (Leite et al., 2017). An athlete's success is thought to relate not only to his superior performance but also to his ability to recover (Micklewright et al., 2011). In this sense, the recovery process is a step by which an athlete eliminates fatigue that arises after the end of training or competition. restores energy metabolism (Bishop et al., 2008).

There are important ways to support the relationship between the use of recovery methods after high-intensity exercise and the improvement of various physical performance indicators. These methods have generally proven effective in the athlete's recovery process in many sports, including: B. Passive rest, sports massage, active recovery, immersion in cold water, compression clothing, and foam rolling (Henderson, 2021) (Kirby, 2021)

Research on the effectiveness of sports massage in the rehabilitation of injured athletes is limited and results are mixed. Massage promotes the healing process of the athlete's wound, thereby improving the functional status of the athlete. Therefore, the purpose of this study was to find out whether sports massage can speed up recovery in athletes.

The novelty of this study lies in its exploration of how sports massage, among various recovery methods like passive rest, active recovery, and immersion in cold water, contributes uniquely to the rehabilitation and functional improvement of athletes. While existing research on

sports massage in injury rehabilitation yields mixed results, its potential in enhancing recovery rates and restoring energy metabolism post-exercise remains promising (Bishop et al., 2008; Henderson, 2021).

By investigating the effectiveness of sports massage in this context, the study aims to provide empirical evidence supporting its role in optimizing recovery times and enhancing physical performance indicators among athletes. This research could potentially influence sports medicine practices by highlighting massage therapy as a valuable component of comprehensive athlete care and recovery strategies.

METHODS

This study used a literature review approach. A literature review is a comprehensive analysis (not just a summary) of scientific documents directly related to a research question. In other words, the literature shows the congruence between the text and the formulated research question. Depending on the need, a literature review can be a stand-alone task or an introduction to a larger research project. (University of West Florida, 2020).

Literature Review in PICO format:

(P=Population) Athletes, (I=Intervention) Sports massage, (C=Comparative) non-comparative, (O=Outcome) Sports massage is effective in athletes' recovery. The reviewed research journal articles are limited by inclusion and exclusion criteria, with journal entries for the last 10 years, namely 2013 to 2023.

Articles will be reviewed if they meet the following inclusion criteria: (i) the subjects of the study are athletes who have injuries due to sports-related conditions with an age range of 17->37 years.

Research articles will be rejected if the author meets the following exclusion criteria:

(i) research using systematic review methods, (ii) research journals under 2013, (iii) subjects refused to participate. Author Get information based on Database journals such as Google Scholar Addressing in research will be accepted by the author any effect of intervention from each article impacting or not the research sample. To summarize the data the author summarizes the article based on the research subject, age and sex of participants, the type of intervention given (both from frequency, duration, and measuring instruments), the effectiveness of the intervention)

Research instruments using

Phalpase technique: the simplest and most commonly used method of counting pulses and involves palpating the index, ring, and thumb of the right hand for 10 seconds to find the left middle radial pulse (left wrist) and multiplying the count by 6. To work on. or heart rate per minute. A test is a tool used to measure a person's aptitude and ability. This technology can be used to collect data. The information obtained from the results of this study is necessary information because the type of testing carried out is in accordance with the expected information.

Lactic acid: Oxygen is necessary for the normal process by which the body converts glucose into usable energy. During periods of intense activity, even heavy breathing may not provide enough oxygen to maintain the required energy levels. At this point, the body must switch to anaerobic (without oxygen) methods of energy production. Lactic acid (commonly known as lactic acid) is then temporarily produced to help break down glucose and energize your muscles. As soon as activity decreases and more oxygen becomes available, lactic acid production stops. Lactic acid increases the acidity of muscle tissue, causing a burning sensation during intense

exercise. However, this is not the cause of muscle pain that occurs a day or two after exercise. This pain (delayed muscle pain, or DOMS) is not fully understood, but it is most likely caused by minor damage to muscle tissue and an inflammatory response as the body repairs the damage. Participants' lactate levels were measured at rest, at the end of exercise, during mid-recovery, and at the end of recovery as follows: First, wipe the fingertips with an alcohol swab, then use a pen to pierce. Next, 0.2 µl of blood flowing from the surface of the skin is exposed to the Lactate Scout device kit and the mmol/L value is easily determined.

Visual analogue scales (VAS): A psychometric instrument for recording the severity characteristics of disease-related symptoms in individual patients, and their use in rapid classification of symptom severity and disease management (statistically measurable and reproducible). Visual analog pain scale (VAS), monofilament sensitivity test, grip strength, lateral pinch, pulp-to-pulp pinch, and tripod pinch. All tests are performed by a physical therapist who specializes in hand therapy. The visual analogue pain scale (VAS) is used to measure patient-reported pain on a scale from 0 (no pain) to 10 (worst pain).

Sport Massage: a set of special massage techniques / methods tailored to the needs of athletes and athletes. A massage method that uses the hands to massage the muscles of the body. Sports massage operating technology is specifically designed to rub and massage the skin and muscles, and when done correctly in 14 strokes, will improve the smooth circulation of blood and hydration in the body. Sports massage has the effect of reducing stress, increasing tissue elasticity and eliminating lactic acid production. The general public in Indonesia considers sports massage as the most effective way to stimulate the breakdown of lactic acid in muscles. In general the objectives of this sports massage are: 1. Improve blood circulation, 2. Stimulate innervation especially peripheral nerves, increase sensitivity to stimuli. 3. Increase muscle tone (tension), increase muscle elasticity and flexibility, and increase muscle labor. 4. Cleanses and smoothes your skin. Sport as a science has many benefits for athletes. Massage methods performed after high-intensity exercise are often preferred by athletes to improve the body's rest process and muscle recovery. This is a method of sports massage rehabilitation performed by sports massagers of the lower extremities. Participants performed effleurage, petrissage, friction, and effleurage for a total time of 20 minutes per minute.

Body Mass: Study participants' weight was assessed at the time of race registration and immediately after the race was completed using the 349KLX model Health-O-Meter scale (Jarden Corporation, Rye, NY) placed on a hard, flat surface. Body weight is measured when the runner is wearing clothes and running shoes and there are no other objects on the runner's body or hands.

RESULTS AND DISCUSSION

Of the 9 journals that can be researched through *Screening, Eliligibility* and *inclusion*. *Sport Massage* is one of the physiotherapy treatments that uses massage techniques so as to improve blood circulation and lymphatic fluid, reduce pressure on the muscles From this understanding Sport Massage manipulation techniques are specifically designed to prioritize smooth circulation and fluid in the body when rubbing is done,

Table 1. Comparison of *Experimental Group* and *Control Group*

Reviewer	Participant		Intervention		Measurement	Results	Design Study
	Intervention group	Control group	Experimental group	Control group			
(PUTRI, 2022)	n= 12 Unknown	-	Sport Massage	No intervention	Phalpase Technique	p<0.05	Quasi Experimental
(Hamza et al., 2023)	n= 14 17- 20 years	-	Sport Massage	No intervention	Lactic Acid	P<0.05	Clinical Research
(Nunes et al., 2016)	n= 36 37 years old	n= 37 39 years old	Sport Massage	Sport Massage	VASE	P<0.05	RCT
(Hoffman et al., 2016)	n= 23 Unknown	n= 24 Unknown	Sport Massage	Sport Massage	Body Mass	P<0001	RCT
(Romadhona et al., 2019)	n= 24 20 – 30 years	-	Sport Massage	No intervention	Lactic Acid	P<0.001	RCT
(Tianlong & Sim, 2019)	n= 12 >16 years old	-	Sport Massage	No intervention	Lactic Acid	P<0.01	RCT

Based on a literature review study, the authors found that of the 182 sample results the average was dominated by ages 12 – 39 years. Of the many literature found, most literature uses RCT research design, Quasi Experimental, Clinical Research with P<0.05. Experimental group and Control group were given *Sport Massage intervention*.

Table 2. Sport *Massgae Intervention Therapy Dosage*

Reviewer	Type of Intervention	Therapeutic Dosage				Duration Therapy
		F	I	T	T	
(PUTRI, 2022)	Effleurage, Petrissage, Shaking, Tapotement, Walken, Vibration, Skin Rolling	for 10 seconds multiplied by 6	Slight pressure	Sport Massage	20 min	20 minutes during recovery period
(Hamza et al., 2023)	Effleurage, petrissage, friction	for 10 seconds multiplied by 6	Slight pressure	Sport Massage	20 min	20 minutes during recovery period
(Nunes et al., 2016)	Effleurage, Petrissage, Shaking, Tapotement, Walken, Vibration, Skin Rolling	for 10 seconds multiplied by 6 pulses of 1 minute.	Slight pressure	Sport Massage	20 min	20 minutes during recovery period
(Hoffman et al., 2016)	Effleurage, Petrissage, Shaking, Tapotement, Walken, Vibration, Skin Rolling	for 10 seconds multiplied by 6	Slight pressure	Sport Massage	20 min	20 minutes during recovery period
(Romadhona et al., 2019)	Effleurage, Petrissage, Shaking, Tapotement, Walken, Vibration, Skin	for 10 seconds multiplied by 6	Slight pressure	Sport Massage	20 min	20 minutes during recovery

	Rolling					period
(Tianlong & Sim, 2019)	Effleurage, Petrissage, Shaking, Tapotement, Walken, Vibration, Skin Rolling	for 10 seconds multiplied by 6	Slight pressure	Sport Massage	20 min	20 minutes during recovery period

Based on research that has been done, researchers found that there are several types of *massage* movements that can be applied to *recovery* such as *Effleurage, Petrissage, Shaking, Tapotement, Walken, Vibration, Skin Rolling* with a frequency of 10 seconds multiplied by 6, *Intensity of Slight pressure*, with a duration of 20 minutes during the recovery period.

Table 3. *Mean of Study Characteristics*

Reviewer	Measurement	Group experiment		Control group		Significant
		Pre	Post	Pre	Post	
(PUTRI, 2022)	Phalpase Technique	0,741	1 0.935	-	-	p<0.05
(Hamza et al., 2023)	Lactic Acid	16.57±.84	8.87±.7	-	-	P<0.05
(Nunes et al., 2016)	VASE	58 (24)	62 (23)	58 (24)	62 (23)	P<0.05
(Hoffman et al., 2016)	Body Mass	1.5 ± 0.6	7.6 ± 1.7	1.7 ± 1.2	8.5 ± 1.2	P<0001
(Romadhona et al., 2019)	Lactic Acid	3.63 ± 1.04	2.15 ± 0.79	-	-	P<0.00 1
(Tianlong & Sim, 2019)	Lactic Acid	33.16± 35.79	25.52± 22.72	-	-	P<0.01

Based on the table above, when compared with the control group, the intervention group showed a good and significant improvement.

Discussion

Massage is now considered by many people as the most effective way to relieve fatigue and pain after activity. To be fit and healthy, you need many services, including massage. There is now evidence to support the idea that massage is performed by several groups around the world. Archaeologists have found artifacts showing the use of massage in some parts of the world. Although there is no direct prehistoric evidence explaining the use of massage for medical purposes, circumstantial evidence clearly shows a relationship between massage and medicine (Graha & Priyonoadi, 2009). The goals of hand manipulation techniques (massage) include relaxing muscles, increasing flexibility, relieving pain, and improving blood circulation. According to Sutaji (HOLLIN SULISTYORINI, 2023), the physiological effects of sports massage affect all tissues without exception, even deep in the body, including muscles, peripheral nerves, central nervous system, and blood. Lymphatic circulation also affects heart activity, facilitates the process of food intake and has a significant effect on metabolism. Pulse recovery is the number of pulse beats per minute measured after 2 to 5 minutes of rest. Sports massage is a technique that uses hands or special equipment to massage or squeeze certain areas to improve blood circulation for the purpose of medication or pain relief. tired. Massage is generally divided into four types: therapeutic massage, beauty massage, hygiene massage, and sports massage. But the focus of this study was on sports massage and cupping therapy. Sports massage is carried out for preparatory purposes, preventive and curative. Before the treatment is given, initial measurements

are taken to determine the initial condition of the subject by measuring the pulse. The pulse group data was determined using Phatase technology. The farpase method, the simplest and most commonly used pulse counting method, involves palpation of the left middle radial pulse (left wrist) followed by the index, ring, and thumb of the right hand for 10 seconds and multiplying the number by 6. heart rate is 1 minute.

CONCLUSION

Sports massage is the use of hands or special equipment to massage a specific part of the body or improve blood circulation for purposes such as medication or relieving fatigue. In general, massage can be divided into four categories: therapeutic massage, cosmetic massage, hygiene massage, and sports massage. But the focus of this study was on sports massage and cupping therapy. Sports massage is carried out for preparatory purposes, preventive and curative.

A systematic review study comparing sports massage and various additional interventions on different samples, such as patients with seizures, is needed to determine the effectiveness of sports massage for various problems.

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