

Effectiveness of Combination of Massage and Stretching Therapy on Reducing Pain and Increasing Range of Motion in Shoulder Injuries in National Standard Bow Archery Athletes

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ABSTRACT: This research aims to determine (1) the effectiveness of a combination of massage therapy and stretching in reducing pain shoulder injuries in archery athletes Blaburan Archery Club. (2) the effectiveness of a combination of massage therapy and stretching in increasing range of motion (ROM) shoulder injuries in archery athletes Blaburan Archery Club. This research was conducted on February 15-March 15 2024 and it focused on the Blaburan Archery Club located in Blaburan Village, Ngluwar District, Magelang Regency. The research method was a descriptive quantitative method. The research design used a pre-experimental design with a one-group pretest-posttest design. The research population was 15 people with shoulder injuries. The research instruments were a goniometer to measure range of motion and a numeric rating scale to measure pain intensity. The treatment was given by a massage technique using effleurage manipulation (rubbing and scouring), traction and repositioning for approximately 25 minutes and stretching for 5 minutes, carried out for one treatment. The data analysis technique used a paired t test when testing differences in flexion, endorotation and exorotation data, because the data was normally distributed when the normality test was $p > 0.05$, while for pain, extension, adduction and abduction scale data using the Wilcoxon sign rank difference test because the data was not normally distributed, $p < 0.05$. This difference test aimed to determine whether there was a difference between before and after treatment. The results of the research show that (1) Range of motion of the shoulder joint as measured by a goniometer in flexion movements from 153.67 ± 11.7 to 177.33 ± 4.1 (15%), extension movements from 52.00 ± 10.3 to 69.67 ± 10.0 (33%), adduction movement from 39.00 ± 8.9 to 148.67 ± 18.0 (54%), abduction movement from 148.67 ± 18.0 to 177.33 ± 3.2 (19%), endorotational movements from 56.00 ± 16.7 to 83.00 ± 16.7 (48%), and exorotational movements from 71.27 ± 14.0 to 86.40 ± 1.5 (21%). (2) Data results on pain measured by using a numerical rating scale from 6.40 ± 1.54 decreases to 3.20 ± 1.52 (50%). In conclusion, massage and stretching are effective in increasing range of motion and reducing pain of the archery athletes who suffer from shoulder injuries.

KEYWORDS: massage, stretching, pain, range of motion, shoulder injury

INTRODUCTION

Humans often carry out activities with different mental conditions and social patterns so that each individual's activities are based on the needs of each individual[1]. Movements made during activities can cause injuries, injuries usually occur in muscles, joints, ligaments, tendons, and bones which are usually characterized by pain, heat, redness, swelling, and impaired function [2]. One activity that many people engage in is exercise. In general, exercise is a physical activity undertaken by humans to achieve a specific goal[3]. There are many types of sports that can be used as a means of exercising, ranging from light, moderate, high, to very high intensity. The goal of exercising is to achieve physical fitness, health, or enjoyment, or simply to pursue a hobby. An athlete, on the other hand, strives to achieve success as a champion[4]. One of the sports that is currently starting to develop and has many fans is archery[3].

Archery is a static sport where the upper extremities are the most dominant in its implementation. In archery, good physical condition and endurance are also required when doing it[5]. Judging from kinesiology, the main muscles involved in the archery process include the neck, shoulders, biceps, triceps, forearms, wrists, stomach and buttock muscles [3]. The movements

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in archery are monotonous and repetitive. The weight of the bow, combined with the workload of drawing it during training, competitions, and afterward, can lead to muscle fatigue or, even worse, injury.

Furthermore, Wuriyani[6] explained that injuries are prone to occur due to the body's lack of physical preparation for exercise, due to athletes' inadequate warm-up. Injuries that frequently occur in archery involve the upper extremities, particularly the shoulders[6]. Previous research on an inter-university archery competition in India in 2013 showed that the percentage of shoulder injuries reached 64.74%. These shoulder injuries are often accompanied by pain that has been experienced before[7]. Another study showed that 64.7% of 62 athletes suffered shoulder injuries. The main cause was overuse of the upper extremities, coupled with the weight and pull of the bow that the athletes experienced while shooting[8].

Injury is a result of work carried out by the body where the work exceeds the body's capabilities, the causative forces can occur quickly or over a long period[4]. Injuries don't just occur in athletes undergoing training programs; the general public, who have busy schedules, high mobility, and frequently carry heavy loads, are also at risk of injury. One body part that frequently experiences injury is the shoulder[7]. Factors that cause injuries are: (1) internal factors including body posture (malalignment), excessive load, physical condition, muscle imbalance, incorrect movement coordination, and lack of warming up (2) external factors including sports equipment, environmental conditions, body contact sports and (3) overuse due to excessive muscle use or being too tired[2]. Research in 2014 showed that shoulder injury cases in Iran reached 41.5% with the third highest prevalence rate after back and neck injuries[9]. Research at the Physical Therapy Clinic (PTC) shows that the highest percentage of injuries is shoulder injuries at 29.4%[10]. A common shoulder injury is a shoulder separation or torn ligament, particularly in sports that primarily involve the upper extremities, such as badminton, tennis, and archery. A partial or complete tear of the acromioclavicular and coracoclavicular ligaments results in a visible gap between the clavicle and the scapula, a simple illustration of which is known as a shoulder separation. There are two joints in the shoulder, located at each end of the clavicle: the acromioclavicular (AC) and sternoclavicular (SC) joints. The sternoclavicular (SC) joint has more movement in all directions and is a type of gliding rotation. The shoulder joint is stable because the sternal end of the clavicle rests in the notch of the clavicle on the manubrium of the sternum and is held in place by ligaments to stabilize and maintain its position[11]. The ball-and-socket type of shoulder joint, which is a synovial joint, has the widest range of motion but is osteologically unstable. The three bones that make up the shoulder joint are the scapula, clavicle, and humerus[12]. The structure of the shoulder joint is very complex because when carrying out shoulder movements it involves 4 main joints, namely (1) the glenohumeral joint (GH), (2) the acromioclavicular joint (AC), (3) the sternoclavicular joint (SC), (4) the scapulothoracic joint (ST)[13].

Characteristics of injuries experienced by many athletes in the blaburan archery club include: (1) Dislocation is the most common injury because the joint cup is relatively flat. Shoulder dislocation occurs due to the shoulder being pulled backwards which cannot be anticipated by the muscles so that the humeral head shifts slightly, which is usually called subluxation. Symptoms that arise during dislocation are pain. (2) Rotator Cuff Disorders (Tendinitis and Bursitis) are injuries caused by inflammation of the tendons and/or bursa that occur in the rotator cuff or biceps muscles. The muscles that make up the rotator cuff are the infraspinatus, supraspinatus, subscapular and teres minor muscles. Usually this inflammatory process causes the rotator cuff to be trapped under the acromion. This condition is often called impingement syndrome. (3) Muscle spasms or also called muscle cramps are involuntary, continuous and localized muscle contractions which are usually characterized by twitching, stiffness, or sudden pain, often also called muscle spasms. These spasms are characterized by muscle contractions accompanied by intense pain. Any movement exacerbates the pain and increases the contractions. This creates a cycle of pain, spasms, and inability to move. Other causes of muscle spasms include repetitive and frequent muscle use, dehydration, and exercising in hot weather. Stress can also be a contributing factor.

Injuries that occur during exercise if not immediately treated properly can result in disruption of physical functions which are needed to carry out daily activities or do the sport being undertaken, even worse, this injury for athletes can mean having to rest for a relatively long time or even require the athlete to leave the sport itself[4]. Therefore, sports injury management must be carried out by a multidisciplinary team or team with expertise in sports injury management. Currently, people prefer to avoid medical procedures such as surgery or medication, preferring manual treatment or manipulative therapy. Manipulative therapy is used by doctors, including physical therapists, to diagnose and treat soft tissue and joint structures with the goal of reducing pain, increasing range of motion (ROM), and repairing contractile and non-contractile tissues so that the body functions properly.

The most commonly used manipulative therapies are massage and chiropractic. In addition to massage and chiropractic, exercise therapy is also a well-known therapy method that plays a significant role in health promotion and injury recovery. Massage is a widely used treatment method for pain reduction, rehabilitation, and improving physical function. Massage therapy is defined as a combination of touch or stroking techniques designed to reduce pain, normalize muscle or tissue tone, and

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restore movement and function of the musculoskeletal system. This is preceded by a comprehensive examination and evaluation of the patient's complaints. Anggait[14],

Massage given to the body has an effect on the body, including on lymphatic blood circulation, where massage can improve blood circulation so that with smooth blood circulation, it will speed up the transport of nutrients and energy sources for the body[15]. Massage also affects metabolism, where massage manipulation can accelerate venous circulation. This venous circulation transports metabolic waste and carbon dioxide, which is then secreted and excreted through secretions, which can relieve muscle and nerve tension more quickly and relieve fatigue. Perfect elimination of metabolic waste will relieve fatigue and muscle and nerve stiffness more quickly. The effect of massage on the skin: massaging can stimulate and assist skin function. The mechanism of massage can improve skin quality, elasticity, and flexibility. Massage delivered with a certain rhythm and pressure has different effects, where massage can activate organs, combat nervous imbalances and anxiety, and can also increase/decrease the sensitivity and reactivity of nerve elements. Massage also affects internal tissues and organs, where massage can increase appetite, improve digestion, absorption, and evacuation[16].

A study used two types of manipulative therapy: frirage massage and acupressure to reduce pain and increase range of motion (ROM) in the shoulder joint. The results showed that both the frirage massage and the combination of frirage massage and acupressure significantly reduced pain and increased ROM ($p < 0.05$)[17]. Other studies have found that massage therapy, exercise therapy, and a combination of massage and exercise therapy have a significant effect on healing shoulder injuries ($p < 0.05$) as indicated by increased ROM and decreased pain perception. The percentage of increased ROM and decreased pain perception due to massage therapy averaged 25.4%, exercise therapy averaged 13.5%, and combination of massage and exercise therapy averaged 38.0%. It can be seen that of the three types of therapy, the most effective are (1) a combination of massage therapy and exercise therapy (2) only massage therapy treatment and (3) only exercise therapy treatment [18]. This study and previous studies have similarities in massage treatment for shoulder injuries, namely manipulation techniques consisting of effleurage, traction, and repositioning.

So far, based on the literature review, there has been little research on the management of shoulder injuries in archery athletes. Shoulder injuries that occur in archery athletes during shooting are similar to those that occur in the general population, caused by everyday activities. These include joint dislocations and muscle pain. This study aims to determine whether massage methods used to treat shoulder injuries in the general population can be applied to archery athletes at the Blaburan Archery Club to reduce pain and increase range of motion (ROM).

Based on these problems, the researcher wishes to conduct research on "The Effectiveness of a Combination of Massage Therapy and Stretching on Reducing Pain and Increasing Range of Motion for Shoulder Injuries in Archery Athletes at the Blaburan Archery Club."

MATERIALS AND METHODS

Study design

This research is a quasi-experimental with a research design using a *one group pretest posttest design*. This research design has only one group of research subjects that will be given treatment, without a control group as a comparison. Before the treatment is carried out, an initial measurement will be carried out first to obtain pretest data with the aim of knowing the initial condition of the sample. Measurements will be carried out again after treatment is given to obtain posttest data. The pretest and posttest data that have been obtained are then compared to assess changes and effectiveness that occur after treatment.

Participants

The research was conducted at the Blaburan Archery Club in the southern part of Magelang Regency, specifically in Bligo Village, Ngeluwar District. The study was conducted from February 15 to March 15, 2024. The researcher used purposive sampling, a method used to determine the sample size based on previously known characteristics of the population [19]. The study used a sample of Blaburan Archery Club archery athletes who met the criteria. Then, using the Slovin formula, the sample size was 13.6, which was then rounded up to 15.

The broad scope of the problem, limited time, and cost of this research, this research will narrow the focus of the research, namely to examine Effectiveness Of Combination Of Massage And Stretching Therapy on Reducing Pain And Increasing Range Of Motion In Shoulder Injuries In Blaburan Archery Club Archery Athletes.

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Instruments

Research instruments are tools to help collect data needed in research and also serve as evaluation tools for research results to ensure they comply with the standards determined by the researcher [20] This study used an instrument that included pre-test and post-test measurements in a series of pain and ROM measurements. Measurements were taken before and after treatment. *Numerical Rating Scale* (NRS) Pain measurement using the Numerical Rating Scale (NRS), the measurement scale using the NRS uses a number count of 1-10 cm with a range of meanings: 0 cm = no pain, 1– 3 cm = mild pain, 4– 6 cm = moderate pain, 7– 9 cm = severe pain, and 10 cm = very painful/the worst pain. Goniometer ROM measurement using a goniometer, ROM measurement is measuring the range of motion of the shoulder joint in flexion, extension, adduction, abduction, internal rotation, external rotation movements, in order to observe the limits of shoulder movement and shoulder muscle tension.

RESULTS

This study was conducted to determine the effectiveness of manipulative therapy and stretching in reducing pain and increasing range of motion in shoulder injuries. The study subjects were 15 people, 6 of whom were male and 9 of whom were female. The purpose of this study was to determine the effectiveness of massage and stretching in reducing pain and increasing range of motion in shoulder injuries. The sample in this study was 15 people. This study included a pre-experimental design with a one-group pretest-posttest design, where the research subjects were divided into one group according to the researcher's criteria, then data collection and measurements were carried out before and after being given massage and stretching treatments with the aim of knowing whether there were any changes experienced by the subjects before and after being given treatment.

The results of the study showed that the combination of massage and stretching therapy had a significant effect on the healing of shoulder injuries in Blaburan Archery Club archery athletes in the acute, subacute and chronic phases with a mild category which can be seen from the decrease in pain perception and an increase in the range of shoulder ROM measured using NRS and goniometer. The treatment provided was in the form of massage with effleurage techniques (rubbing and grinding), traction and repositioning as well as active stretching carried out by the subject accompanied and directed by the therapist.

The following table shows the average and standard deviation of the pretest and posttest measurement results of massage and stretching on reducing pain and increasing range of motion in shoulder injuries.

The average value results showed a decrease in complaints after treatment was given.

Table 1. Average and standard deviation of research subject measurement results

Variabel	Perlakuann	Rata-Rata ± Std. Deviasi
Skala Nyeri	Pretest	6,40 ± 1,54
	Posttest	3,20 ± 1,52
Fleksi	Pretest	153,67 ± 11,7
	Posttest	177,33 ± 4,1
Ekstensi	Pretest	52,00 ± 10,3
	Posttest	69,67 ± 10,0
Adduksi	Pretest	39,00 ± 8,9
	Posttest	60,33 ± 16,1
Abduksi	Pretest	148,67 ± 18,0
	Posttest	177,33 ± 3,2
Endorotasi	Pretest	56,00 ± 16,7
	Posttest	83,00 ± 16,7
Eksorotasi	Pretest	71,27 ± 14,0
	Posttest	86,40 ± 1,5

Below are explained in the table the results of the normality test. The normality test is carried out to determine the distribution of the data. Data can be said to be normal if $p > 0.05$ and abnormal if $p < 0.05$.

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Table 2. Normality Test Results with *Shapiro Wilk*

<i>Shapiro Wilk</i>			
Variabel	Total (N 15) Signifikasi	Kesimpulan	Uji Beda
Skala Nyeri	0,048	Tidak Terdistribusi Normal	<i>Uji Wilcoxon</i>
<i>Fleksi</i>	0,389	Terdistribusi Normal	<i>Uji Paired T Tes</i>
<i>Ekstensi</i>	0,022	Tidak Terdistribusi Normal	<i>Uji Wilcoxon</i>
<i>Adduksi</i>	0,010	Tidak Terdistribusi Normal	<i>Uji Wilcoxon</i>
<i>Abduksi</i>	0,012	Tidak Terdistribusi Normal	<i>Uji Wilcoxon</i>
<i>Endorotasi</i>	0,224	Terdistribusi Normal	<i>Uji Paired T Tes</i>
<i>Eksorotasi</i>	0,284	Terdistribusi Normal	<i>Uji Paired T Tes</i>

Figure 2 shows that the results of the normality test are generally significant, but on the pain scale and extension, adduction and abduction movements there are abnormalities with $p < 0.05$. The results of the hypothesis test using the paired T-test and Wilcoxon test to determine whether the hypothesis is accepted or rejected are explained in the table below.

Table 3. Test the difference using Paired T-test

Variabel	Pretest	Posttes	Sig (2-Tailed)	Kesimpulan
<i>Fleksi</i>	11,7	4,1	0,000	Signifikan
<i>Endorotasi</i>	16,7	16,7	0,000	Signifikan
<i>Eksorotasi</i>	14,0	1,5	0,000	Signifikan

The results of the hypothesis test using the paired T-test obtained a significance value of 0.000, which is less than 0.05. Therefore, from this data, it can be concluded that if H_0 is rejected and H_1 is accepted, thus there is effectiveness of massage and stretching in reducing pain and increasing range of motion in shoulder injuries.

Table 4. Difference test using Wilcoxon

Variabel	Pretest	Posttes	Asymp. Sig (2-tailed)	Kesimpulan
Nyeri	1,54	1,52	0,001	Signifikan
<i>Ekstensi</i>	10,3	10,0	0,001	Signifikan
<i>Adduksi</i>	8,9	16,1	0,001	Signifikan
<i>Abduksi</i>	18,0	3,2	0,001	Signifikan

Based on Figure 4 on the pain scale and extension, adduction and abduction movements in the normality test were not normally distributed, so the Wilcoxon difference test was used. The results of this difference test showed an Asymptomatic sign (2-tailed) of 0.001 more than 0.05. It was concluded that if H_0 was rejected and H_1 was accepted, it means that there was an effectiveness of the combination of massage and stretching therapy in reducing pain and increasing the range of motion of shoulder injuries in archery athletes of the Blaburan Archery Club.

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DISCUSSION

Shoulder injuries are common among Blaburan Archery Club archers. Shoulder injuries are often caused by excessive training, excessive weight, incorrect technique, and monotonous movements. Injuries experienced by athletes can hinder archery or daily activities, so appropriate treatment is needed to treat the injury and prevent it from worsening. Statistical analysis shows that massage therapy has a significant effect on reducing pain and increasing range of motion in shoulder injuries among Blaburan Archery Club archery athletes. These results can be explained by the massage containing actions that have the function of treating shoulder injuries. Massage therapy manipulation uses effleurage techniques (rubbing and grinding), traction, and repositioning performed in a sitting position.

The massage provides the benefits of relaxing muscles, reducing muscle tension, improving blood circulation and reducing pain, which is then carried out by traction and repositioning the shoulder joint to return the joint to its original position so that the injury can be handled. There is also the addition of stretching which functions to mobilize the joint as well as to train the joint to be able to perform the maximum ROM range. The results of the study supported by data processing from the SPSS Statistic 25 application show that the results of pain perception have decreased by 50% and the range of motion has increased in flexion movements by 15%, extension by 33%, adduction by 54%, abduction by 19%, endorotation by 48%, exorotation by 21%.

From the results of the research data analysis, it was also proven that stretching has a significant effect on reducing muscle spasms, improving blood circulation to the shoulder and relieving pain as well as increasing the range of ROM [21]. The benefits of stretching for healing shoulder injuries can be seen in increased ROM and decreased pain levels after stretching. This can be explained by the effect of stretching, increased flexibility, stamina (muscle endurance), reduced muscle pain, increased muscle and joint mobility, more efficient muscle movement and smoother movement [22]. The type of stretching provided is active stretching performed by the subject himself accompanied by a therapist so that it can be controlled and effectively heal the shoulder injuries of the Blaburan Archery Club archery athletes.

Research has shown that a combination of massage and stretching therapy is effective in treating shoulder injuries in Blaburan Archery Club archery athletes. This suggests that combining massage and stretching therapy optimally improves shoulder injury recovery because the two therapies complement each other, resulting in better results.

Research result This is in accordance with research entitled "The Effect of Massage Therapy, Exercise Therapy, and Combination Massage and Exercise Therapy in Healing Chronic Shoulder Injuries in Athletes" conducted by Nova & Kushartanti

[18] The research sample was divided into 3 groups: 1 group was given massage therapy, 1 group was given exercise therapy, and 1 group was given a combination of massage and exercise therapy. The results showed that massage therapy, exercise therapy, and the combination of massage and exercise had a significant effect on increasing ROM and decreasing pain perception ($p < 0.05$). The percentage of increasing ROM and decreasing pain perception by massage therapy averaged 25.416%, exercise therapy averaged 13.568%, and the combination of massage and exercise averaged 38.004%. It can be said that the results of the author's research with previous research are in accordance, with a significant decrease in pain perception with the provision of massage. The similarity in this study is the use of massage therapy techniques carried out on the sample and the samples used were athletes or sportsmen. The difference with this study lies in the sample group, where the research sample was divided into 3 groups.

The significance of stretching in increasing the range of ROM is in accordance with research conducted by Mulyani et al. [23] entitled "The Effect of Stretching on Reducing Complaints of Shoulder Muscle Pain (Myalgia) in Workers at PT. Coats Rejo Indonesia" which was conducted in 2023. This study used a quantitative method with a one-group pre-post test research design. The population was 42 workers with complaints of shoulder muscle pain at PT. Coats Rejo Indonesia. The sample taken was 38 respondents using a non-probability sampling technique with a purposive sampling method. Data analysis used SPSS Wilcoxon rank statistical test. The results of the analysis in the study showed that the provision of stretching techniques had a significant effect on complaints of shoulder muscle pain (myalgia) with the result ($p = 0.000$). In conclusion, there is an effect of providing stretching techniques on reducing complaints of shoulder pain (myalgia) in workers. The similarity of this study lies in both using stretching to overcome complaints of pain in the shoulder. The difference in this study lies in the work where this study the work of the sample is as an athlete while the work in the previous study the sample was a factory worker.

After undergoing massage for shoulder injuries, archery athletes need to pay attention to several important things to support the healing process. Things to do include maintaining body hydration to help the process of tissue secretion, doing light movement or passive stretching to maintain flexibility, and following a functional rehabilitation program such as strengthening exercises tailored to the condition of the injury.

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CONCLUSION

After conducting a series of studies, based on the results of the explanation in the research and discussion, it was concluded that providing massage and stretching was effective and significant in reducing pain and increasing the range of motion of shoulder injuries in archery athletes at the Blaburan Archery Club.

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