

The Effect of Active and Passive Recovery Exercise in Reduring DOMS (Delayed Onset Muscle Soreness): Critical Review

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ABSTRACT

Background: *Sport is an activity that has a positive effect on an individual. DOMS occurs when a person starts exercising after a long period of inactivity and results from an increase in the load and intensity of the exercise. DOMS is characterized by the onset of muscle soreness after exercise. Any type of activity that places an unusual load on the muscles can cause DOMS.*

Objective: *to determine the existence of active recovery and passive recovery in reducing DOMS (delayed onset muscle soreness).*

Method: *The study design in this research is a critical review. The data were obtained using several literature searches, namely Physiotherapy Evidence Database (PEDro), Science Direct, Google scholar, pubmed, NCBI, Jane Biosemantic.*

Results: *based on 7 articles found, 3 articles said massage with the rolling massage technique had a significant effect on reducing doms symptoms, 2 articles said it was not effective, 1 article said aerobic exercise had an effect on preventing doms and 1 article said stretching was not effective.*

Conclusion: *The review shown most of the studies used 20 minutes combined with foam roller reducing DOMS effect.*

INTRODUCTION

Sport is an activity that has a positive effect on an individual, Sport is defined as part of an exercise carried out individually or as part of a team, where the individual has

a defined goal (Jay K et al., 2014). DOMS occurs when a person starts exercising after a long period of inactivity and results from an increase in the load and intensity of the exercise. DOMS is characterized by the onset

of pain in the muscles after exercise. Any type of activity that places an unusual load on the muscles can cause DOMS. Other effects of DOMS are reduced Range of Motion (ROM), swelling, and decreased muscle function. DOMS begins to occur within 12-24 hours after exercise, peaks in the range 24-48 hours after exercise and subsides within five days to seven days after exercise. (Prihantoro & Ambardini, 2018).

DOMS is characterized by a dull aching sensation; this pain is usually felt on movement or when the affected muscle is palpated and is usually accompanied by stiffness and tenderness. DOMS is considered as one of the symptoms of muscle damage caused by exercise consisting of eccentric contractions (Xie et al., 2018).

Muscle soreness occurs when muscle fibers are torn, and the muscles adapt to maintain their strength. Muscle strain occurs as a result of overtraining that occurs in most muscle fibers that affect the degree of motion and tendons. Pain and muscle damage can occur due to continuous exercise (Guo et al., 2017).

In individuals affected by Delayed Onset Muscle Soreness (DOMS) will feel pain so that individuals are afraid or anxious to move the injured part, the individual will choose

to reduce the movement that will cause pain and choose to rest, it makes muscle strength decrease (Veqar, 2013).

Physiotherapy has many modalities that can be given to reduce complaints in individuals who experience DOMS, one of which is active recovery and passive exercise. Recovery is a process to restore muscles and other body parts to their original condition before being given exercise (Lesmana et al., 2018). Recovery aims to give the body time to rest and to repair damaged or injured muscle cells. Recovery can be done actively or passively. Active recovery is doing a physical activity with a light intensity. and passive recovery is not doing any activity or complete rest (Sari, 2016).

The benefits of active recovery and passive exercise are to eliminate lactic acid levels and restore physical condition to normal. One of the active recovery interventions can be given exercise in the form of active stretching, active stretching will stretch the myofibrils and muscle sarcomeres, it can provide the ability for muscles to contract and relax. and passive recovery interventions can be given massage therapy, the benefit of massage therapy is to reduce discomfort that occurs in the muscles (Lewis et al., 2012).

The formulation of the problem in this study is whether active recovery and passive exercise are effective in reducing Delayed Onset Muscle Soreness (DOMS) in athletes. While the purpose of this study was to determine the effect of active and passive recovery exercise in reducing Delayed Onset Muscle Soreness.

METHODS AND MATERIALS

The study design in this research is a critical review. Critical review is a method that analyzes and evaluates an article, book, or other media. In writing a good critical review, the author must understand the material, understand how to analyze, and evaluate the material using the appropriate criteria. The data search base was obtained by using several literature searches, namely Physiotherapy Evidence Database (PEDro), Science Direct, Google scholar, Pubmed, NCBI, Jane Biosemantic. Then the next stage of screening is carried out to obtain articles that are relevant to the research studies carried out. The appraisal stage uses the PEDro scale to determine the level of bias in the journal so that it can be seen whether active recovery (active stretching) and passive exercise (massage) interventions are recommended for patients or not.

RESULTS AND DISCUSSION

Determine the inclusion and exclusion criteria in this study using the PICO standard. It is intended that the article to be reviewed is relevant and appropriate to be used as a reference and basis for this study. The PICO standard consists of 4 points, namely P (Population), I (Intervention), C (Comparison), and O (Outcome). In the 7 articles used as the basis for this study, the population used was mostly healthy people, both athletes and non-athletes with an age range of 18-30 years, while the interventions given in these 7 articles were mostly massage with foam roller and effleurage techniques. For physical exercise intervention in the form of stretching with dynamic stretching techniques, static stretching, aerobic exercise. Of the 7 articles, a control group was used as a comparison which was not given any intervention and who was given electrotherapy intervention. The results of the article partially state that roller massage can reduce the impact of DOMS, some say that roller massage is not effective. In an article using a physical exercise intervention said that aerobic exercise can prevent the risk of developing DOMS. For clearer details, see the PICO table below.

Table 1. PICO

Title	Subject	Intervention	Comparison	Outcome
<i>Foam Rolling For Delayed –Onset Muscle Soreness and Recovery of Dynamic Performance Measures</i>	<ul style="list-style-type: none"> • Subjects 8 men • Age :22 years old • Healthy male population who do moderate to very active physical activity. 	Foam rolling group <ul style="list-style-type: none"> • Frequency : 50 beats per minute • Intensity: 2 repetitions with 15 seconds rest • Time: 20 minutes • Type : roller massage 	The control group was only asked to take a break	The effect of foam rolling is reduced muscle pain
<i>Effect of foam rolling for delayed onset muscle soreness on loaded military task performance and perceived recovery</i>	<ul style="list-style-type: none"> • 20 healthy and physically active male and female subjects. • 18-30 years old • Foam rolling group • Passive recovery group 	Foam rolling group <ul style="list-style-type: none"> • Frequency : 50 beats per minute • Intensity: 2 repetitions, with a rest 15 seconds • Type : roller massage • Time : 20 min 	The passive recovery group was asked to rest for 20 minutes without doing any activity	Foam rolling can improve recovery from DOMS and increase military readiness and effectiveness and can reduce the risk of musculoskeletal injuries
<i>Comparison of a foam rolling session with active joint motion and without joint motion : A randomized controlled trial</i>	<ul style="list-style-type: none"> • Subjects 30 healthy adults • Age 25 years • Active joint motion group : 15 participants • Group without joint motion : 15 participants 	Active joint motion group <ul style="list-style-type: none"> • Frequency: between 10pm to 2pm per session with 2 minutes • Intensity :- • Type : commercial internet based instruction video • Time : 2 minutes 	Group without joint motion <ul style="list-style-type: none"> • Frequency :- • Intensity :- • Type : roller massage without joint motion • Time : 2 minutes 	Foam rollers with dynamic stretch have a positive effect on flexibility without affecting muscle strength. Combining active joint motion with foam rolling can enhance the intervening effect.
<i>The Efficacy of Dynamic Contract-Relax Stretching on Delayed-Onset Muscle Soreness Among Healthy Individuals: A Randomized Clinical Trial</i>	<ul style="list-style-type: none"> • S u b j e c t s 48 healthy participants • D y n a m i c stretching group : 16 participants • Static stretching group : 16 participants • Control group : 16 participants 	1. DS Group <ul style="list-style-type: none"> • Frequency : 5 days (2 times per day) • Intensity: 10 repetitions with a rest of 10 seconds in each set • Time :30 seconds • Type: dynamic stretching Static stretching group <ul style="list-style-type: none"> • Frequency : 5 days (2 times per day) • Intensity: 10 repetitions with a rest 10 seconds • Time : 30 seconds • Type: static stretching 	The control group was asked to rest and avoid any treatment or exercise	Dynamic stretching and static stretching cannot prevent ROM decrease and do not reduce pain

Title	Subject	Intervention	Comparison	Outcome
<i>The Effect of one Session Of Roller Massage on Recovery From Exercise- Induced Muscle Damage: A Randomized controlled Trial</i>	<ul style="list-style-type: none"> • Subjects 36 participants in good health • 18-25 years old • Foam rolling group • Sham . group • Control group 	1. Foam rolling group <ul style="list-style-type: none"> • Frequency : 60 beats per minute • Intensity : - • Type: rolling massage • Time : 5 minutes Sham . group <ul style="list-style-type: none"> • Frequency : 60 beats per minute • Intensity : - • Time : 5 minutes • Type : - 	The control group was allowed to rest for 5 minutes	Rom did not change before and after the intervention. One session of roller massage is not effective for repairing damage caused by doms.
<i>Comparison of the effectiveness of manual massage, long - wave diathermy, and sham long -wave diathermy for the management of delayed-onset muscle soreness: a randomized controlled trial</i>	<ul style="list-style-type: none"> • Subject 51 people • Manual massage group : 19 people • rLWD group : 17 people • Sham LWD group : 19 people • Age 23-60 years old • Male athlete population 	1.1 Manual massage group <ul style="list-style-type: none"> • Frequency : - • Intensity : - • Type : Efflurage • Time : 10 minutes 	rLWD . group <ul style="list-style-type: none"> • Frequency : 750 kHz • Intensity : - • T y p e : Long Wave Diathermy (red coral, tecnosis, sixtus, italy) • Time : 10 minutes 	Manual massage, Rlwd and sLWD did not cause significant changes seen from the DOMS NPRS score
<i>The effect if warm-up and cool-down exercise on delayed onset muscle soreness in the quadriceps muscle : A Randomized Controlled Trial</i>	<ul style="list-style-type: none"> • Subjects 36 healthy people (21 women and 15 men) • Age 20-30 years • Warm-up group: women(n:7),men (n:5) • Cooling group: women (n:7), men (n:5) • Control group: women (n:7), men (n:5) 	1. Warm-up group <ul style="list-style-type: none"> • Frequency : 3 days (difference < 2 hours per day) • Intensity : 5 sets with 10 reps and rest 30 seconds, load 40%-50% HRmax • Type : Aerobic exercise • Time : 10-20 minutes 	Control group <ul style="list-style-type: none"> • Frequency : 3 days • I n t e n s i t y : medium • T y p e : r e s i s t a n c e training • Time : 20 minutes 	Can prevent muscle pain due to doms but can't prevent loss of muscle strength

DOMS (Delayed Onset Muscle Soreness) is a condition that occurs as a result of unusual or excessive strenuous exercise. To reduce DOMS symptoms, physiotherapy has several modalities, one of which is massage and active stretching.

Some articles say that massage with a rolling massage technique is effective for reducing DOMS symptoms. In the first article conducted by Pearcey et al., 2015, in this study the researcher gave an intervention by doing massage with a rolling massage

technique for 20 minutes with a rhythm of 50 beats per minute.

In the second article conducted by Scudamore et al, 2021, the intervention was in the form of a rolling massage for 45 seconds with a rest of 15 seconds and 2 repetitions. The third study conducted by Cheatham & Stull, 2018, in this study compared the foam rolling intervention combined with active joint motion and foam rolling without joint motion. Participants were given foam rolling intervention combined with active joint motion for 2 minutes and without active joint motion for 2 minutes.

The fourth article examined by Xie Y et al, 2017, in this study used dynamic stretching and static stretching interventions with a control group as a comparison. stretching is done for 30 seconds with 10 seconds rest and 10 repetitions and the program is done 2 times a day.

The fifth study conducted by Medeiros et al, 2020, in this study researchers looked at the short- and medium-term effects of roller massage. The intervention was carried out for 5 minutes with a frequency of 60 beats per minute.

The sixth article discusses research conducted by Visconti et al, 2020, in this study comparing interventions in the form of

manual massage with efflurance, long wave diathermy and sham long wave diathermy techniques. efflurance is carried out for 10 minutes and long wave diathermy for 10 minutes with a capacity of 750 kHz

The last article discusses the research conducted by Olsen O, et al, 2012, this study used a warm-up and cool-down exercise intervention. warm up with moderate-intensity aerobic exercise for 20 minutes and then do 5 sets of lunge exercises with 10 repetitions with a rest for 30 seconds in each set, the load is set at 40% and 50% of the subject's body mass after which they cool down for 20 seconds with aerobic exercise.

Rolling massage has been shown to increase blood lactate removal and tissue healing. Foam rollers have systemic biochemical effects, massage-associated biochemical changes are increased circulating neutrophil levels, smaller increase in post-exercise plasma keratin kinase, activated mechanosensory sensors that signal COX7B and ND1 transcription, suggesting that new mitochondria are being formed and may accelerate muscle healing and less active heat-shock proteins and immune cytokines reflecting less cellular stress and inflammation.

These biochemical changes are caused by massage which puts constant pressure on the muscles. Foam roller substantially reduces negative effects due to DOMS. While the physical exercise of dynamic stretching and static stretching did not have the effect of lengthening the intramuscular connective tissue.

The application of a combination of exercises may be an intervention aimed at optimizing the reduction of doms symptoms. It is hoped that the intervention in the form of a combination will be able to give more effect than giving one treatment, so that in the future the resulting effect can reduce doms which is better and can prevent the occurrence of doms.

CONCLUSIONS AND SUGGESTIONS

Based on the analysis of the results of the critical review studies that have been carried out on the seven selected articles, the authors can conclude that the intervention in the form of massage with foam rolling technique for 20 minutes and the combination of foam roller with active joint motion has a significant effect on reducing doms symptoms. . And stretching is less effective in reducing doms symptoms.

Suggestions for professional organizations that massage intervention can be used as one of the recommended interventions as an alternative or primary therapy for the rehabilitation program of patients with doms symptoms in order to reduce the negative impact of doms. Thus, these findings can be an insight for the physiotherapy professional organization.

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