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Effectiveness of Foam Rolling Against Changes in Range of Motion and Pain Degree due to Delayed Onset of Muscle Soreness Post 10Km Long Distance Running in Trained Young Men

Original Article

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Abstract
Delayed Onset Muscle Soreness (DOMS) is a form of injury that often occurs after training. Once, muscle experiencing DOMS the body will experience decreased muscle strength, Range of Motion (ROM), increased inflammatory response. This is a *Quasi Experiment,* by using theOne Group Repeated-Measures Design. Providing treatment with a foam roller to the sample to see changes in ROM body functions. The results of this study indicate that there is a decrease in ROM due to DOMS post a 10Km Long Distance Running activity. the calculated reduction in this research is lower extremities, namely Joint Hip, Knee, and Ankle. The research showed that there was a change in the Range of Motion after being measured at 24 hours, 48 hours and 72 hours compared to the pre-test data. The results of this study are based on statistical tests using Repeated Measures Anova with significant of P <.05. The result of pain degree is the distribution of muscle data that feels the greatest pain in Quadriceps Femoris 70%, Tibialis Anterior 30%, Triceps Surae 30%, Gluteus 30%, and Hamstring 10%. The conclusion of this study is the effect of foam roller on increasing Range of Motion and decreasing pain level that occurs in lower extremities.

Keywords: *myofascial release, exercise therapy, urban sports*

INTRODUCTION

When an individual does exercise too much of complaints are felt by sports players. This usuallymakes a person not interested in doing sports. The pain felt by sports players specifically for people who are new to sports activities is the most common reason. When muscles that are not accustomed to doing physical activity are a little heavier then automatically the muscles will feel pain, the pain is usually called muscle injury caused by a heavy training load. On Athletes who are in a training program that is a bit excessive and carried out repeatedly in the long run that can cause injury (1). Injuries experienced while getting an exercise program can be handled by themselves because injuries received by the body are not so severe just as swelling, pain and functional decline in the body (2). Negative effects after injury canoccur due to heavy loading on the muscles.

Delayed onset muscle soreness (DOMS) is a condition in which pain and discomfort that develops in the nerve muscles, and the metabolic system about 24 hours after exercise, reaches a peak after 24 hours to 72 hours and the effect will gradually disappear after 5-7 days later (3). The mechanism of Delayed Onset Muscle Soreness (DOMS) can be associated with pain stimulation caused by lactic acid formation, muscle stiffness, connective tissue damage, muscle damage, inflammation (4). Measuring instruments used to measure pain in DOMS are Visual Analogue Scale (VAS) with tenderness pain provocation (3).

Muscle when experiencing delayed onset muscle soreness (DOMS) the body will experience decreased muscle strength, Range of Motion, increased inflammatory response (Burnley et al, 2010). The range of motion scope that can be done by a joint is also the basis for establishing a joint in a normal or abnormal state. When the body experiences DOMS Delay Onset of soreness, the Range of Motion decreases in degree. Foam roller is a device used to actively massage the muscles by the person himself, by moving the foam roller at a time when a person will get pressure on soft tissue such as muscles from his own body weight (6). Another advantage of the foam roller is that it can increase flexibility and joint motion (3).

MATERIAL AND METHODS

This research is a type of Quasi Experiment research, using the One Group Repeated-Measures Design. One Group Repeated-measures Design is a repeated measurement of the experimental group (13). To find out how the influence of the foam roller on the reduction in pain (VAS) and increase in Range of Motion (ROM) after conducting a 10 Km Long Distance Running activity.

RESULTS

The results of the Anova Repeated Measures Test found that changes in the Range of Motion of the Join Hip in the movements of Flexion, Extension, Adduction, Abduction, Endo-rotation, and Ekso-rotation. The results obtained were significant changes P <0.5. no significant changes were also found in the Range of Motion JointHip P <.05 there were no significant changes.

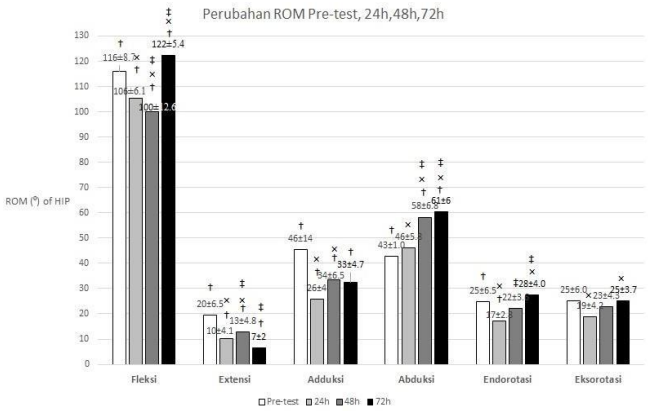

Figure 1. Graphic of ROM Joint Hip Change
†:Comparison between Pretest with 24 hours, 48 hours, 72 hours
×: Comparison of 24 hours vs 48 hours, 72 hours
‡: Comparison between 48 hours vs. 72 hours

The results of the Anova Repeated Measures Test found that the change in the Range of Motion of the Join Hip on Flexion. The results obtained were significant changes P <0.5. no significant changes were also found in the Range of Motion Joint Hip P <.05 there were no significant changes.

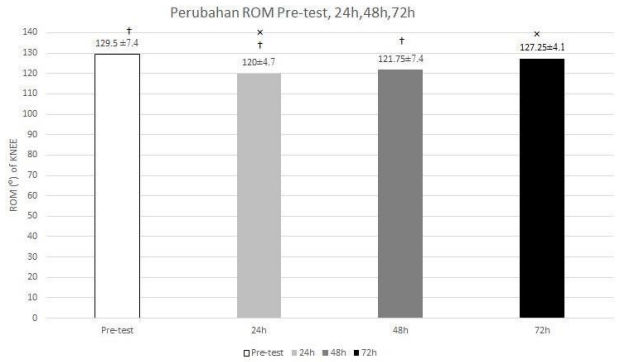

Figure 2. Graph of changing ROM Knee
Note: sign of a significant increase
†:Comparison between Pretest with 24 hours, 48 hours, 72 hours
×: Comparison of 24 hours vs 48 hours, 72 hours
‡: Comparison between 48 hours vs. 72 hours

The results of the Anova Repeated Measures Test found that changes in the Range of Motion in the Join Hip in the dorsiflexion, plantarflextion, inversion, and eversion movements. The results obtained were significant changes P <0.5. no significant changes were also found in the Range of Motion Joint Hip P <.05 there were no significant changes.

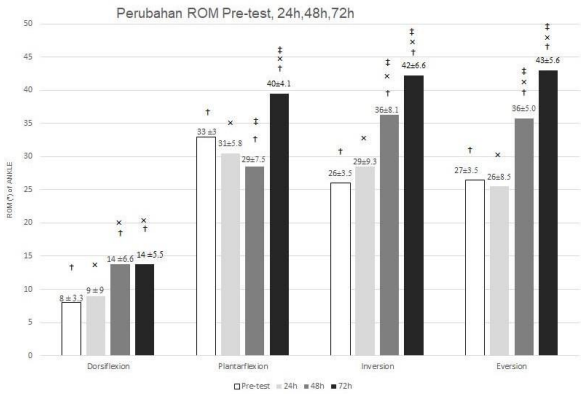

Figure 3. Graph of Ankle ROM change
Note: sign of a significant increase
†:Comparison between Pretest with 24 hours, 48 hours, 72 hours
×: Comparison of 24 hours vs 48 hours, 72 hours
‡: Comparison between 48 hours vs. 72 hours

Table 1. Degrees of Pain in Five Muscle Groups

MuscleGroup	Measurement time	VASE									
		No pain		MildPain		Moderate Pain		Severepain		Super	
TricepsSurae	*Pre-Test*	5	50%	3	30%	2	20%	0	0%	0	0%
	24 hours	1	10%	2	20%	4	40%	3	30%	0	0%
	48 hours	2	20%	1	10%	6	60%	1	10%	0	0%
	72 hours	5	50%	4	40%	1	10%	0	0%	0	0%
AnteriorTibialis	*Pre-Test*	6	60%	2	20%	2	20%	0	0%	0	0%
	24 hours	2	20%	3	30%	2	20%	3	30%	0	0%
	48 hours	2	20%	4	40%	4	40%	0	0%	0	0%
	72 hours	8	80%	1	10%	1	10%	0	0%	0	0%

Quadriceps Femoris	*Pre Test*	6	60%	2	20%	2	20%	0	0%	0	0%
	24 hours	1	10%	2	20%	0	0%	7	70%	0	0%
	48 hours	1	10%	3	30%	4	40%	2	20%	0	0%
	72 hours	5	50%	3	30%	1	10%	1	10%	0	0%
Hamstring	*Pre Test*	6	60%	3	30%	1	10%	0	0%	0	0%
	24 hours	1	10%	4	40%	4	40%	1	10%	0	0%
	48 hours	2	20%	5	50%	3	30%	0	0%	0	0%
	72 hours	8	80%	1	10%	1	10%	0	0%	0	0%
Glutes	*Pre Test*	7	70%	3	30%	0	0%	0	0%	0	0%
	24 hours	2	20%	3	30%	2	20%	3	30%	0	0%
	48 hours	2	20%	5	50%	3	30%	0	0%	0	0%
	72 hours	7	70%	2	20%	1	10%	0	0%	0	0%

Measurement of the degree of pain using the Visual analogue scale (VAS). Which is classified as follows: The muscle parts measured in this study were Triceps Surae, Tibialis Anterior, Quadriceps Femoris, Hamstring, and Glutes. There is a distribution of data on the degree of pain in each muscle group measured. The results showed that there was an increase in the 24h period after carrying out Long Distance Running activities and a decrease in the 72h period. The results of data distribution can be seen in table 1.

DISCUSSION

In Triceps Surae muscle, the pain experienced by the most painful sample occurred 24 hours after running 10km, reaching 30% of 10 samples experiencing severe pain and decreased in 72 hours with the percentage of 50% no pain. In previous studies which stated that the scale value obtained by triceps surae muscle on a scale of 6 with maximal drop jump exercises which in this study resulted in DOMS as well (7). The pain that occurs in the Anterior Tibialis muscle experiences a peak of pain within 24 hours after running 10km, the highest percentage occurs on a severe pain scale reaching 30% and decreases at 72 hours on severe pain to 0%. In Quadriceps muscle the peak of pain occurs at 24 hours the percentage of natural pain is 70% severe pain and decreased at 72 hours 50% no pain. This happens because the quadriceps muscle has a role to support when running (8). In a previous study that discussed the effect of foam roller on reducing pain in quadriceps muscle the results that can be foam roller can help relieve DOMS (Adi Prianto, 2016). Delayed Onset of Muscle Soreness (DOMS), which is pain and stiffness that is felt in the muscles a few hours to a few days after unusual or strenuous exercise (10). In Hamstring muscle the pain of peak pain occurs at 24 hours 10% decreased pain occurs in 72 hours percentage of 80% painless. In the study of running biomechanics, it has been proven that when running, hamstring muscles have a high risk of injury occurring during the swing phase just before touching the ground (11). In the study of running biomechanics, it has been proven that when running, hamstring muscles have a high risk of injury occurring during the swing phase just before touching the ground (11).

In the Gluteus muscle the peak pain occurs at 24 hours 30% feel severe pain and a decrease occurs at 72 hours 70% no pain. This situation shows that DOMS occurred in the sample after running 10km and foam rolling can provide a decrease in pain in samples experiencing DOMS, this can be seen from the percentage of time. As stated in previous studies that foam rolling can help improve muscle performance and flexibility and reduce muscle fatigue and pain (12). Meanwhile, in hip joint flexion there is a change in range of motion, ie at 48 to 72 hours, this change is significant, as evidenced by a 18% increase in the increase from 48 to 72 hours after running 10km and foam roller treatment. Previous studies have suggested that foam

rollers can increase ROM in hip flexion. In the study, changes in ROM flexion were greater by using a foam roller than without the use of a foam roller (13).

In the extension motion, there was no increase in the range of motion, the decrease occurred at the pretest and 72 hours by 7% of the pretest value. Adduction increasedat the time of measurement 24 hours and 48 hours an increase of 2% from the initial value of 24 hours. The decrease occurred at the pretest and 24 hours decreased by 4.3% of the pretest value. Abduction has increased at each time the largest increase at the time of the pretest and 72 hours by 3% of the value of the pretest. Endorotationhas increased at pretest and 72 by 1% of the results of the pretest. A decrease in abduction occurred at the pretest and 24-hour decrease of 4.4%. The excerptation changes which at the time of the pretest value is equal to 72 hours. When the body feels the DOMS decreases the joint power of the cell to do its job in order to be able to do normal movements (14). When the body finishes doing sports activities, it will experience acute muscle pain that affects the range of motion (15). Knee ROM with flexion motion, in knee flexion movement increased at 48 hours and 72 hours by 2.3% of the 28 hour value. The decrease also occurred at pretest and 24 hours by 7.6%. The decrease in knee flexion occurs because the extrinsic burden experienced during running is greater to hold the load (16). Ankle ROM measures dorsiflexion, plantarflection, inversion, and eversion. Dorsiflexion increased in pretest time and 72 hours by 4.2% of the pretest value. The results of the increase that occurred in the sample occurred because of the provision of foam rollers. This is in line with previous research stating that ROM in Dorsifelksi experienced a greater change using a foam roller than without giving a foam roller (17). Plantarflection experienced the greatest increase at 48 hours and 72 hours by 2.7% from the 48 hour value. The decrease occurred at the pretest and 48 hours by 1.2%. Ankle ROM tends to decrease within 48 hours after intense extrinsic activity (16). Inversion increased at pretest and 72 hours by 5.8% of the pretest value. Eversion experienced the most increase in measurement time 24 hours and 72 hours by 4% of the 24 hour value. Increased ROM after a foam roller occurs because the muscles and joints become relaxed. It was also conveyed that foam rollers can increase flexibility and joint motion (3).

CONCLUSION

Based on research results that have been obtained with data analysis, it can be concluded that. *Long distance running* 10 km has been shown to significantly reduce the range of motion (ROM). Foam Rolling can significantly increase the range of motion (ROM). Percentage of DOMS occurrence after 10 km long distance running occurred on the first day (24 hours). Percentage of decrease in degree of pain after the treatment of foam rollingoccurred in the second (48 hours) and third (72 hours). With reference to the results of research that researchers have been able to suggest. For future researchers, this research can be a further reference regarding theuse of foam rollers as an active recovery of the reduction in DOMS and an increase in Range of Motion and it is hoped that further researchers will be able to do more varied with more sample sizes. *Foam roller* can be used as an active recovery in reducing the degree of pain due to DOMS

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CONFLICTS OF INTEREST

Conflict of interest : Authors state no conflict of interest.

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