

## Effect Of Manual Therapy In The Management Of Delayed Onset Muscle Soreness: A Literature Review

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### ABSTRACT

**Background:** Delayed Onset Muscle Soreness is commonly prevalent amongst sportspersons. It leads to decreased athletic performance. There is a controversy in the management of this clinical condition.

**Objective:** The main objective of this literature review was to evaluate the effectiveness of manual therapy in the management of delayed onset muscle soreness.

**Methods:** Literature research was performed on different databases namely Google Scholar, PubMed, and Research Gate. The articles were screened between 2019 and 2024 with the keywords like “manual therapy”, “delayed onset muscle soreness”. This study includes only those articles which evaluate the parameters of delayed onset muscle soreness recovery like pain, range of motion functional recovery. The studies included in this review focused on various manual therapy techniques as a method of intervention.

**Result:** After the screening of eligibility, abstract and full text, a total of 04 randomized controlled trails were included in the study. This literature review found that manual therapy was effective in reducing pain and other parameters of delayed onset muscle soreness along with other interventions like stretching and cold-water immersion.

**Conclusion:** The study is inconclusive of any findings. More research is needed to reach a firm conclusion.

**Keywords:** Manual therapy, Delayed Onset Muscle Soreness, Massage therapy.

### INTRODUCTION

Delayed- onset muscle soreness (DOMS) is described as common clinical condition experienced by majority of sportsperson following major eccentric activities after 24-72 hours <sup>[1,2]</sup>. DOMS negatively affects the athlete's performance via affecting the muscular strength, shock absorption and ability to perform the coordinated movements <sup>[3,4]</sup>. The management of DOMS is still considered controversial since the path physiology behind it is unknown. DOMS can occur because of alteration of normal lineage my filaments; thickening or complete disruption of Z lines of sarcomeres; increase in the muscle cell enzyme creatine kinase (CK) level. Etiological factors of DOMS include accumulation of lactic acid; muscular spasm; homeostasis and NGF (nerve growth factor). Common treatment methods utilized for its

management include thermotherapy, compression, cryotherapy, and manual therapy <sup>[5,6,7]</sup>. Manual therapy is the preferred treatment intervention for DOMS, as easy to perform <sup>[8,9,10,11]</sup>. Massage is defined as a soft tissue manipulation performed in a skillful and purposeful manner via utilizing the hands, forearm, elbow, knees , feet and digital pressure which may or may not accompany the use of cryotherapy or thermotherapy in order to achieve therapeutic gain <sup>[12]</sup>. It is used commonly for a variety of therapeutic effects in the cases of pain , swelling, decreased range of motion, muscular sprain, tension and anxiety affecting musculoskeletal, neurological and cardiorespiratory symptoms. It is widely used by the majority of sportsperson in aiding enhanced recovery from strenuous exercises <sup>[13]</sup>. Manual therapy techniques utilized for managing the

symptoms of DOMS includes superficial effleurage, deep effleurage, petrissage and tapotement. “Superficial effleurage” is the sliding of both hands in the direction of muscle fibers from distal to proximal direction with a gentle pressure on the associated body tissues. “Deep effleurage” is the sliding of both hands in the direction of muscle fibers from distal to proximal direction with more pressure on the associated body tissues. “Petrissage” is the use of surface of the palm of the hand to compress and lift the tissue sequentially. “Tapotement” is the agitation of tissues with the cupped hands. There seems to be controversy in the management of DOMS, due to the variety of treatment options. The present literature was conducted to evaluate the influence of manual therapy in the management of DOMS symptoms.

## METHODOLOGY

**Search Strategy:** Literature search was performed with keywords like “manual therapy,” “delayed onset muscle soreness” amongst the different databases like Google Scholar, PubMed, and Research Gate. The articles were searched between 2018 to 2022. Boolean operators like AND Or were used.

**Inclusion criteria:** The studies were included if they were.

- (i) published in English language
- (ii) available as full- text
- (iii) included sportsperson as participants
- (iv) utilized manual therapy as intervention measure

**Exclusion criteria:** The studies were excluded if they were.

- (i) Unpublished Work
- (ii) Conference Proceedings

(iii) Reviews

**Data Extraction:** Articles were included in this study after screening of eligibility, abstract and full text. The included studies were then qualitatively analyzed.

**Participants Characteristics:** The present study included a total of 233 sportspersons out of which 78 were runners [17]; 55 were ski mountaineering racers [14]; 40 were athletes [15] and the remaining 60 were team sports athletes (soccer, handball, and volleyball) [16].

**Study Design:** All the studies included were RCT’s (Randomized Controlled Trials). The studies were conducted in different countries: Australia [17]; Italy [14]; Pakistan [15] and Greece [16].

**Outcome Measures:** NPRS (Numeric Pain Rating Scale) was utilized as an outcome measure in 03 studies [14,15,17]; followed by Vertical jump performance which was used in 02 studies [15,17]. Other outcome measures used were Mc Gill Pain Questionnaire, isometric strength, flexibility, mood [17]; PGIC (Patient Global Impression of Change Scale) [14]; sprint speed [15]; borg rate of perceived exertion, VAS (Visual Analogue Scale), ROM (Range of Motion), CPK (Creatinine Phosphokinase) in serum [16].

## RESULT

**Table 1** Describes the characteristics of the studies included in this literature review.

**Table 2** Describes the population, intervention, comparison, and outcome measures of the included studies. This literature review included a total of 04 studies [14,15,16,17].

**Table 1: Characteristics of the included studies**

Author Name; Year; Country	Objective	Research Design/ Participant Characteristics	Procedure	Outcome measure	Conclusion
Bender et al. <sup>[17]</sup> ; 2019; Australia	To study the effect of massage therapy on pain after habitual running.	RCT; 78 runners. age: 18-60 years	Two groups were made; experimental group (quadriceps massage for 10 mins); control group (sham hip and knee mobilisation for 10 mins)	NPRS, McGill Pain Questionnaire, vertical jump performance, isometric strength, flexibility, Mood	Massage therapy was effective in reducing pain.
Visconti et al. <sup>[14]</sup> ; 2020; Italy	To compare the effect of manual massage, long wave diathermy, and sham long wave diathermy for the management of DOMS.	RCT; 55 ski mountaineering racers, all males; Age: 23-60 years	Three groups were made, first group received sham LWD (10 mins switched-off after 10 sec switched-on) (n=19); second group received manual massage (10 mins. Pain-free effleurage in both limbs) (n=19); third group received real LWD (10 mins switched-on) (n=19)	NPRS, PGIC	No significant changes in NPRS scores.
Rehman et al. <sup>[15]</sup> ; 2021; Pakistan	To compare massage therapy and passive stretching for reducing DOMS of tibialis anterior.	RCT; 40 male athletes	Two groups were made Group A (massage therapy for 10 mins x 3 days); group B (static stretching for 20 secs 4 reps x 3 days); Prior to intervention DOMS were induced by performing 3 sets of test side ankle eccentric plantarflexion with 20 secs rest in between	NPRS, Vertical jump scores, sprint speed	Massage therapy and static stretching both were found to be effective for reducing the muscle soreness in tibialis anterior muscle as well as for improving athletes' performance.

Angelopoulos et al. <sup>[16]</sup> , 2022; Greece	To compare cold water immersion and sports massage in athletes with DOMS.	RCT; 60 male athletes of team sports (soccer, handball, volleyball); Mean age :21 years	60 participants were divided into four groups: CWI group (n=15), massage group (n=15), combined massage and CWI group (n=15), control group(n=15)	BOGR, VAS, ROM, CPK in serum	CWI and sports massage help in decreasing pain.
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#### Abbreviations:

NPRS: Numeric Pain Rating Scale

PGIC: Patient Global Impression of Change Scale

VAS: Visual Analogue Scale

ROM: Range of Motion

CPK: Creatinine Phosphokinase

CWI: Cold Water Immersion

LWD: Long Wave Diathermy

DOMS: Delayed Onset Muscle Soreness; RCT: Randomized Controlled Trial

**Table 2: PICO parameters of the included studies**

Author Name; Year; Country	Population	Intervention	Comparison	Outcome Variable
Bender et al. <sup>[17]</sup> ; 2019; Australia	Runners	Massage: 10 minutes <ul style="list-style-type: none"> <li>• Superficial effleurage: 01 minute</li> <li>• Deep effleurage: 03 minutes,</li> <li>• Petrissage: 03 minutes</li> <li>• Tapotement: 1 minute</li> <li>• Superficial effleurage: 2 minutes</li> </ul>	<ul style="list-style-type: none"> <li>• Sham hip joint mobilizations</li> <li>• Sham knee joint mobilizations</li> </ul>	<ul style="list-style-type: none"> <li>• Pain and perceived fatigue</li> <li>• Pain behaviour</li> <li>• Mood profile</li> <li>• Flexibility</li> <li>• Vertical jump performance</li> <li>• Isometric strength</li> </ul>
Visconti et al. <sup>[14]</sup> ; 2020; Italy	Ski-mountaineering racers	Pain – free effleurage: 10 minutes in bilateral lower limbs <ul style="list-style-type: none"> <li>• Prone position (posterior compartment muscles: hamstring and triceps surae)</li> <li>• Supine position (anterior compartment muscles: quadriceps and foot dorsiflexors)</li> </ul>	<ul style="list-style-type: none"> <li>• Real long wave diathermy</li> <li>• Sham long wave diathermy</li> </ul>	<ul style="list-style-type: none"> <li>• Pain</li> <li>• Perceived recovery</li> </ul>

Rehman et al. <sup>[15]</sup> ; 2021; Pakistan	Athletes	<p>Sports massage: 10 minutes for 03 days on tibialis anterior muscle.</p> <ul style="list-style-type: none"> <li>• Effleurage (stroking): 02 minutes</li> <li>• Petrissage (kneading): 02 minutes</li> <li>• Tapotement (percussion): 02 minutes</li> <li>• Deep tissue massage: 02 minutes</li> <li>• Effleurage: 02 minutes</li> </ul>	Static stretching	<ul style="list-style-type: none"> <li>• Pain</li> <li>• Speed</li> <li>• Vertical jump performance</li> </ul>
Angelopoulos et al. <sup>[16]</sup> ; 2022; Greece	Amateur athletes	<p>Sports massage: 20 minutes (10 minutes for each quadriceps muscle)</p> <ul style="list-style-type: none"> <li>• Effleurage: 02 minutes</li> <li>• Petrissage: 02 minutes</li> <li>• Compressions: 02 minutes</li> <li>• Stripping massage strokes: 02 minutes</li> <li>• Tapotements: 02 minutes</li> </ul>	Cold water immersion	<ul style="list-style-type: none"> <li>• Fatigue</li> <li>• Pain</li> <li>• Range of motion</li> <li>• Level of creatine phosphokinase</li> </ul>

### Effect of manual therapies on the management of DOMS symptoms:

A randomized trial study was conducted to study the effect of massage therapy on pain after habitual sporting activity. The study concluded that massage therapy was effective in reducing the intensity of pain. As there is limited research evaluating the effect of massage therapy after habitual sporting activity, the primary research question of this study was to find out the effect of massage therapy in improving the mood and performance of runners after habitual sporting activity (10 - km run), thereby reducing pain and perceived fatigue in the quadriceps muscle. 78 participants were enrolled in this study, out of which two groups were made each comprising of 39 participants. The experimental group received quadriceps massage for 10 minutes, and control group received sham hip and knee mobilizations for 10 minutes. Pain, perceived fatigue, flexibility, mood, strength, and vertical jump were the main outcome measures. This study found that there was significant difference between

the control group and experimental group on numeric pain rating scale. This study has also found that massage therapy has no effect on the jumping performance, flexibility, strength, and perceived fatigue. Although, it was effective in reducing pain intensity after being applied to the quadriceps muscle [17].

A randomized controlled trial to compare the effectiveness of manual massage, long- wave diathermy, and sham long- wave diathermy for the management of delayed- onset muscle soreness was conducted. Long wave diathermy (LWD) is also referred as capacitive and resistive electric transfer therapy transmits heat and aids in microcirculation and cell metabolism. The evidence of its effect is limited besides knowing the fact that heat resolves the symptoms of DOMS. So, their study was aimed to study the effects of manual massage, real LWD and sham LWD on pain and its post- treatment effects in a group of athletes with lower limb DOMS. In this study, a total of 55 individuals were incorporated in the study which were divided into three groups. There were 19 participants in the manual massage group; 17 participants in the real LWD group and the remaining 19 participants were from the sham LWD group.



The participant's age was between 23 to 60 years. NPRS (Numeric Pain Rating Scale) questionnaire and PGIC (Patient Global Impression of Change Scale) were the two main outcome measures utilized in the study. They documented no significant difference was founded regarding the NPRS (numeric pain rating scale) between the real LWD, sham LWD and manual muscle groups. In their study, any strong conclusion cannot be drawn [14].

Another randomized controlled study was conducted to compare the effect of massage therapy and static stretching in reducing DOMS of tibialis anterior. This study finds the literature gap in the fact that there is limited evidence of comparison of these two techniques on DOMS of tibialis anterior muscle. The objective of this study was to find the effect of these two techniques on the performance of the athlete. In this study, 40 individuals were incorporated into the study Age group of athletes 18 to 30 years. Two groups were made, each carrying an equal number of participants (20). The first group was group -A (massage therapy) and second group was group -B (static stretching). DOMS was induced in both the groups before applying intervention. NPRS (Numeric Pain Rating Scale), vertical jump height test and sprint speed test were the outcome measures. They reported no significant difference was observed by the researchers between massage therapy and static stretching among the athletes with tibialis anterior DOMS. The study concluded that static stretching positively influences the performance of the athletes [15].

A randomized controlled trial to study the effect of cold – water immersion and sports massage in athletes with delayed onset muscle soreness (DOMS) was conducted. This research was conducted to find out the combined effect of these two techniques in the management of DOMS. Sixty male athletes were incorporated in the study which were randomized into four groups of 15 participants each (a cold water immersion group, a massage group, a combined massage and cold water immersion group and a control group). BORG scale, VAS scale, ROM of the knee joint, knee isometrics strength and CPK (Creatinine Phosphokinase) levels in the blood

serum were the outcome measures. They stated that there are no significant changes between the two groups. This study concluded that these two techniques did not affect the adaptations caused by DOMS but causes significant reduction in pain. Thus, these techniques can be considered as a measure of intervention for recovery followed by DOMS [16].

## DISCUSSION

The primary objective of this literature review was to find out the effectiveness of manual therapy in the management of DOMS. In this literature review 04 randomized controlled trial studies were included. The included studies utilized diverse types of manual therapy techniques like superficial effleurage, deep effleurage, tapotement, petrissage. All the included studies were conducted on athletic population. Due to limited access to the databases few studies were gathered. The duration of manual therapy techniques application varies between 10 minutes to 20 minutes. The main outcome measures studied were pain, range of motion, vertical jump performance, fatigue as well as perceived recovery. The location of DOMS was lower limb usually sustained after encountering strenuous activities. This study provides evidence regarding the beneficial effects of using massage in the treatment of DOMS.

## LIMITATIONS OF THE STUDY

The present literature review has few limitations. This study included very few studies due to limited access to the databases. Secondly, meta- analysis is not performed in this study.

## FUTURE SCOPE OF THE STUDY

Future studies can focus on meta- analysis of the randomized controlled trials to find out the effectiveness of manual therapy techniques in the management of symptoms of DOMS.

## CONCLUSION

This study concludes that manual therapy is effective in reducing delayed onset muscle

soreness in combination with other techniques like stretching and cold-water immersion. However, more studies are needed to confirm the existing findings.

### CONFLICT OF INTEREST

The author declares no conflict of interest.

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