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Sports massage therapy on the reduction of delayed onset muscle soreness: A systematic review and meta analysis

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Abstract

Background: DOMS (Delayed Onset Muscle Soreness) is a condition where muscle pain appears shortly after activity, usually occurring shortly after doing sports or activities that exceed the usual capacity. It can also be caused by doing sports or activities he has never done before. DOMS usually appears in a healthy person but mainly occurs in athletes. A sports massage intervention is recommended to reduce the DOMS in the recovery process.
Purpose: To determine whether sports massage can reduce DOMS and provide recovery effects on a person.
Method: This research is a systematic review and meta-analysis using the PRISMA diagram. Performed article search with eligibility test with PICO. Population: people with DOMS. Intervention: Sport massage. Comparison: control treatment. Outcome: pain reduction. The articles used came from 2 databases, namely PubMed and Science Direct. The keywords in this article search are "DOMS," AND "Recovery," AND "Sport massage." The inclusion criteria in this study were full-text articles with a Randomized Control Trial research design. The relationship measure used is Mean SD. This article was analyzed using the Review Manager 5.4 application.
Results: The eight articles reviewed were from California, Canada, Spain, the USA, South Africa, and Brazil. The results showed that sports massage could not reduce DOMS effectively and significantly. A person with DOMS who received sports massage had an average pain score of -0.19, lower than someone who received control treatment (SMD= -0.19; 95% CI= -1.93 to 0.10; p=0.19).
Conclusion: Sports massage cannot reduce DOMS in the recovery process effectively and significantly.

Keywords: Delayed Onset Muscle Soreness (DOMS); Recovery; Sport Massage

INTRODUCTION

In sports, many things become obstacles to achieving goals, such as the emergence of various problems during implementation. Problems that arise during sports can interfere with the professionalism of athletes and optimize the success of athletes when doing sports, one of which is DOMS (Delayed Onset Muscle Soreness). The appearance of DOMS can interfere with the activity and performance of athletes, especially during competition (Kargarfard, Lam, Shariat, Shaw, Shaw, & Thamrin, 2016). When the problem arises, some athletes will try to recover, and it is not uncommon for athletes to visit the clinic to find out how to handle the DOMS they experience correctly. Recovery aimed at athletes has several approaches, including hydration and diet, active stretching, and adequate rest (Hoffman, Badowski, Chin, & Stuempfle, 2016). One of the pain recovery efforts that can be done is to do sports or sports massage.

Some researchers have hypothesized that the existence of DOMS has a relationship with muscle structures that experience ion imbalances, signs of inflammation, and the appearance of pain (Hilbert, Sforzo & Swensen, 2003; Sonkodi, Kopa, & Nyirády,

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2021). The physiological effect of massage is the potential to affect and improve blood flow and reduce the presence of lactic acid (Dawson, Dawson, Thomas, & Tiidus, 2011; Tejero-Fernández, Membrilla-Mesa, Galiano-Castillo, & Arroyo-Morales, 2015; Tianlong, & Sim, 2019).

In recovery efforts, massage techniques can eliminate extracellular fluid that gathers in muscles that experience DOMS and reduce the presence of one of the signs of inflammation, namely tumors or swelling. Thus, it can improve the performance and professionalism of athletes (Kargarfard, Lam, Shariat, Shaw, Shaw, & Thamrin, 2016). Giving sports massage can be started by doing efflurage or light sweeping techniques on the hand, then giving massage with kneading techniques and lifting the hand, which is usually called petrissage. The addition of tapotement, vibration, and friction can be added at the end of efflurage (Mancinelli, Davis, Aboulhosn, Brady, Eisenhofer, & Foutty, 2006).

The provision of massage treatment in DOMS recovery has several responses from a number of researchers. Some researchers said that massage techniques in DOMS recovery have no effectiveness and that it is better to do light exercise (Mancinelli, Davis, Aboulhosn, Brady, Eisenhofer, & Foutty, 2006). Massage techniques in the recovery of DOMS in sports athletes can prolong the activity of neutrophils that have an association with inflammation so that it can reduce DOMS experienced by athletes (Connolly, Sayers, & McHugh, 2003). Massage techniques are recommended to be given as soon as possible after the game because it is said to accelerate recovery when applied within two hours after the game or match ends (Delextrat, Calleja-González, Hippocrate, & Clarke, 2013).

The main aim of this study was to determine the effectiveness of sports massage during the recovery period of DOMS in athletes after exercise. This study aims to track and examine how massage techniques can affect accelerating recovery from DOMS, which requires further research. The duration of treatment and the techniques used by each athlete are also factors that must be considered.

RESEARCH METHODS

This study is a systematic review and meta-analysis collecting data obtained from several databases, namely Science Direct and PubMed. The literature search used the following keywords: "DOMS", AND "recovery," AND "sport massage."

Meta-analysis was conducted in 5 steps as follows: Formulate the research question in PICO (Population, Intervention, Comparison, Outcome) format; Search for articles from PubMed and Science Direct electronic data; Screening to determine inclusion crit; Extracted data from primary studies and synthesized effect estimates using the Revman 5.4 application, and Analyze results and draw conclusions.

The inclusion criteria in this study are articles listed in reference articles that discuss the effects of sports massage on reducing DOMS and measuring the effect using the mean standard deviation. The research subjects used are people with DOMS conditions, the intervention given is sports massage, the comparison is sports massage, and the resulting outcome is a decrease in DOMS. Exclusion criteria in this study are articles that discuss the effects of sports massage on recovery (strength performance, jump performance, fatigue, and flexibility), articles that are not full-text, and use foreign languages other than Indonesian and English.

The article search used and considered the eligibility technique with the PICO model. The description of PICO in this study is people with DOMS as the population, with sports massage intervention in the recovery process and a decrease in DOMS as an outcome.

Sport Massage refers to an intervention performed on someone with DOMS. It is applied by performing massage techniques in an effort to achieve results. This massage can be in the form of proactive massage on the area that is the trigger point of the complaint. Sports massage is necessary for a number of people because it can increase physical activity and has an essential role in the recovery process (Nopriansyah, 2015).

DOMS refers to a complaint that occurs shortly after an activity or exercise. DOMS is commonly experienced by someone starting a sport or when attempting a movement that has not been done before. However, DOMS can be reduced with

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intervention. The reduction of DOMS is the result that will be achieved in this study.

Recovery refers to the recovery experienced by someone with DOMS. This recovery can progress quickly or slowly depending on several factors (internal and external). A fast recovery will undoubtedly have a good effect on the outcome of the subject.

People with DOMS refer to someone who has complaints of DOMS immediately after doing sports or activities that they do. Usually, people who experience DOMS can be caused by warming up before exercise that is not optimal or doing exercise with a heavier intensity than usual.

The quality assessment carried out in this study is with a demonstrating forest plot on a randomized control trial, which is tested for article quality using Critical Appraisal Skills Programme. The articles in this study were collected according to the PRISMA flowchart and used the Review Manager 5.4 application for data analysis. Analysis using the effect size and heterogeneity of the consistency value of the research results. The result of the data analysis is a *forest plot.*

RESEARCH RESULTS

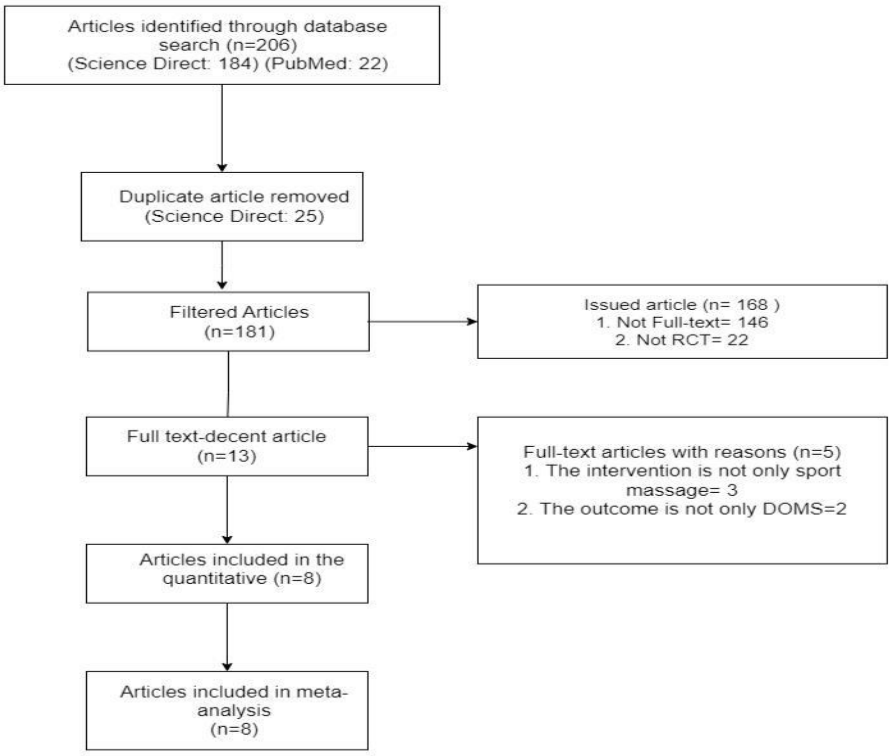

Figure 1. Results Of Prisma Flow Diagrams

The number of articles that can be obtained is 181 articles. In the initial search, 206 were obtained. A screening process was carried out by considering the inclusion and exclusion criteria in the study of 8, and 8 articles were included in the meta-analysis. Assessment of study quality was carried out quantitatively, and in this study, a quality test was carried out with a Randomized Control Trial. The results of testing the quality of the study can be seen by doing a checklist on the Critical Appraisal Skills Program listed in Table 1. Table 2 contains the results of the interpretation of Critical Appraisal Skills Programme. Table 3 contains a description of 8 articles that match the title Effect Sport Massage on Recovery and DOMS.

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Table 1. Assesment of The Quality Of Sport Massage on DOMS Recovery Using Critical Appraisal Skills Programme for Randomized Control Trial Study Design

Primary Study	1	2	3	4	5	6	7	8	9	10	11	Total
Hoffman et al., (2016)	2	2	2	2	2	2	2	2	2	2	2	**22**
Dawson et al., (2011)	2	2	2	2	2	2	2	2	2	2	2	**22**
Delextrat et al., (2013)	2	0	2	2	2	2	2	2	2	2	2	**20**
Hilbert et al., (2003)	2	0	2	2	2	2	2	2	2	2	2	**20**
Dawson et al., (2004)	2	0	2	2	2	2	2	2	2	2	2	**20**
Kargarfard et al., (2016)	2	2	2	2	2	2	2	2	2	2	2	**22**
Mancinelli et al., (2006)	2	2	2	2	2	2	2	2	2	2	2	**22**
Nunes et al., (2016)	2	2	2	2	2	2	2	2	2	2	2	**22**

Note: Yes= 2, Can't Tell=1, No=0

Table 2. Results Assesment of The Quality of Sport Massage on DOMS Recovery Using Critical Appraisal Skills Programme for Randomized Control Trial Study Design

Primary Study	Critical Appraisal RCT (CASP, 2017)	Quality Evaluation
Hoffman et al., (2016)	11/11	Good quality
Dawson et al., (2011)	11/11	Good quality
Delextrat et al., (2013)	10/11	Good quality
Hilbert et al., (2003)	10/11	Good quality
Dawson et al., (2004)	10/11	Good quality
Kargarfard et al., (2016)	11/11	Good quality
Mancinelli et al., (2006)	11/11	Good quality
Nunes et al., (2016)	11/11	Good quality

The scores obtained from the journal quality assessment using the critical appraisal skills program provide an interpretation of the final results obtained (Adref, Syahrul, & Saleh, 2019).

The research included in the systematic review will undergo further systematization by entering several points into the table. These points can contain the researcher's name and year of publication, study location, sample size, population, type of intervention, comparison group, and measurement results.

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Table 3. Description of Primary Studies included in Meta-Analysis

Author (Year)	Country	Sample	P (Population)	I (Intervention)	C (Comparison)	O (Outcome)
Hoffman et al., (2016)	California	72	Ultramarathon Athlete	Massage	rested in the supine position on a cot	Soreness rating
Dawson et al., (2011)	Canada	28	Novice Recreational Runners	Regular proactive massage therapy	Running program	pain
Delextrat et al., (2013)	Spanyol	16	Basketball players	Sport massage	Cold-water immersion (20°C)	Fatigue perception
Hilbert et al., (2003)	USA	18	Volunteers	Massage	Sham massage	Peak tourque
Dawson et al., (2004)	Canada	12	A half marathon runners	Massage	Leg exercise	soreness
Kargarfard et al., (2016)	South Africa	30	Male bodybuilders	Massage	Maintained the normal passive recovery	Muscle soreness
Mancinelli et al., (2006)	USA	22	Female collegiate athletes	Massage	rested	Muscle soreness
Nunes et al., (2016)	Brazil	74	Triathlon athletes	Massage	Rested in sitting	Pain

In accordance with the table above, it can be seen that of the 8 (eight) studies, most, namely 6 (six) studies, came from countries in the Americas (1,2,4,5,7 and 8). As many as 1 (one) study came from the European continent, and 1 (one) study came from the African continent. A total of 8 (eight) studies used a randomized control trial research design. Most of the studies used athletes as the sample. One study used ultramarathon athletes as a sample (1), 1 (one) study used a sample of novice recreational runners (2), 1 (one) study used basketball players as a sample (3), 1 (one) study used a half marathon runners as a sample (5), 1 (one) study used male bodybuilders as a sample (6), 1 (one) study used female collegiate athletes as a sample (6), and 1 (one) study used triathlon athletes as a sample (8). In contrast, only 1 (one) study used volunteers as samples (3).

All studies (1, 2, 3, 4, 5, 6, 7, and 8) provided interventions in the form of sports massage or conditions similar to sports massage. The comparator of the intervention is different from each study; study (1) used rested in the supine position on a cot as a comparison, study (2) used running program as a comparison, study (3) used cold water immersion (20°C) as a comparison, study (4) used sham massage as a comparison, study (5) used leg

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exercise as a comparison, study (6) used maintained the average passive recovery as a comparison, study (7) used rested as a comparison, and study (8) used rested in sitting as a comparison.

The eight studies have different outcomes that have different outcomes to measure sports massage compliance. Research (1) uses (soreness rating) as outcome, research (2) uses (pain) as outcome, research (3) uses (Fatigue perception) as outcome, research (4) uses (Peak torque) as outcome, research (5) uses (soreness) as outcome, research (6) uses (Muscle soreness) as outcome, research (7) uses (Muscle soreness), and research (8) uses (Pain) as outcome.

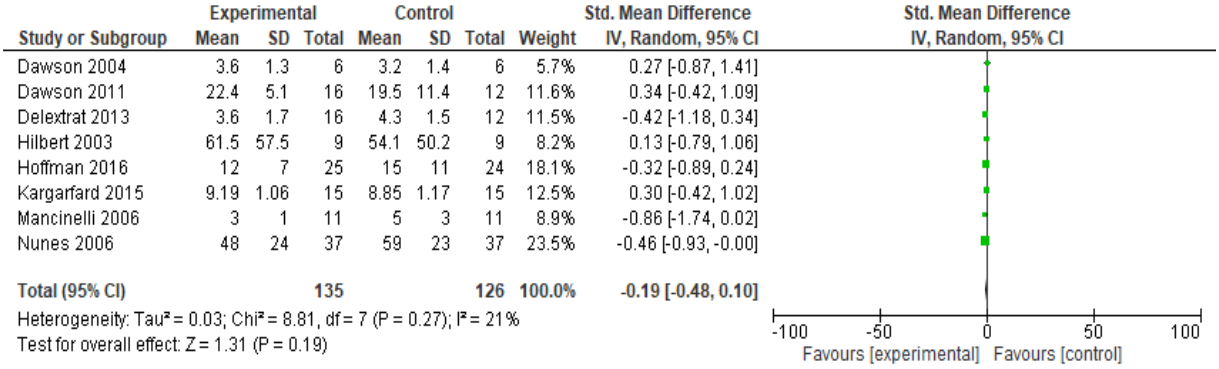

Figure 2. Forest plot of the effect sport massage on DOMS and recovery

This study produces an intensive index of less than 50%, namely (I^2): 21% by using the random effect model. This study has a low heterogeneity value. The low heterogeneity value can also be seen in the p-value, which is >0.05 (p=0.27); this is also evidence that the heterogeneity in the study is low. Forest plot in this study shows that the provision of sports massage in the recovery process in someone who has DOMS is not adequate and has no significant effect, as can be seen in the Test for overall effect p>0.05 (p=0.19). Those with DOMS had a mean soreness score of -0.19 compared to those who received the control treatment (SMD= -0.19; 95% CI= -1.93 to 0.10; p=0.19). This study also had to assess the potential for bias, which can be seen in the following funnel plot results:

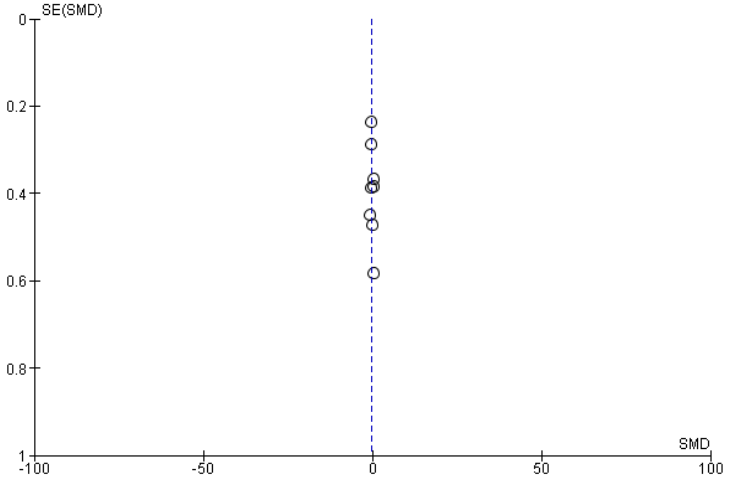

Figure 3. Funnel plot of the effect sport massage on DOMS and recovery

In the funnel plot results, it can be seen that the graph is symmetrical close to the vertical line; it can be judged that there is BIAS potential.

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DISCUSSION

A systematic review and meta-analysis discussed the effectiveness of sports massage on DOMS and recovery in a number of people. Journal quality assessment using the Critical Appraisal Skills Program for Randomized Control Trial study design was also conducted in this meta-analysis. It was found that 5 (five) studies received a final score of 22 (1, 2, 6, 7, and 8), while 3 (three) other studies received a final score of 20 (3, 4, and 5) that interpreted research with good quality (show in table 2).

In the course of DOMS during recovery, sports massage should play a role in it. One of the sports massage techniques is efflurage, which can inhibit the course of DOMS. This is in accordance with the theory put forward by Gate Control Theory. In this theory, it is said that stimulation that comes from skin fibers (tactile) will run to inhibit the course of DOMS with several massage techniques (efflurage, vibration, tapotement, etc.) (Darmawan, 2018). Giving sports massage is proven to improve blood circulation in the process of transporting O2 and CO2 contained in the blood so that there will be a decrease in pain, which is one of the symptoms of DOMS. The efflurage technique in providing tactile stimulation will receive messages sent by large signal fibers (A Delta fibers). The way this fiber works is that it will close the gate in an effort to prevent the Cortex Cerebri from receiving messages or signals (pain). This event is caused by pain (DOMS) that has been blocked by counterstimulation when given the efflurage technique. Therefore, the final message that will be received is a change in pain perception (Ilmawan, 2018).

From the results of the meta-analysis using the Review Manager 5.4 application, it was found that sports massage did not have a significant effect on reducing DOMS in the recovery process, this can be seen in the final result of I2 less than 50% (21%) which means it has low heterogeneity. Then the p-value in the final result shows that the p-value> 0.05 (p = 0.19), this means that the study has no effect (Fillon, 2016). A number of studies have suggested that the provision of sports massage will not have a significant effect and influence. However, this can be overcome by adding other interventions as collaboration. The addition of PNF techniques to the experiment will have an effect on reducing DOMS in the recovery process (Amriyana & Wibowo, 2018).

The independent variable in this study is sports massage, while the independent variable is a decrease in DOMS in a person's recovery process. Eight randomized control trial studies from the Americas (California, Canada, USA, and Brazil), Europe (Spain), and Africa (South Africa) showed that people with DOMS who received sports massage intervention had a pain score of -0.19 units lower than the control treatment (SMD= -0.19; 95% CI= -0.48 to 0.10; p=0.19). However, sports massage was not effective and significant in reducing pain during the recovery process.

The results of this study are in line with previous research which shows that sports massage is not effective in reducing DOMS during the recovery process (Ernst, 1998). This research is also in line with research in patients or other participants with no history of upper arm injury and no experience in resistance training, which explains that if only sports massage is applied to someone with DOMS in the recovery process, it will have no effect unless other interventions are added, in the meta-analysis conducted obtained the results that sports massage treatment alone does not provide a practical effect on reducing DOMS and recovery p>0.05 (p=0.06). (p=0.06) (Zainuddin, Newton, Sacco, & Nosaka, 2005).

CONCLUSION AND SUGGESTION

In general, the provision of sports massage does not affect someone with DOMS in the recovery process. This is evidenced by comparing the treatment effect of someone who experiences DOMS with sports massage intervention and control treatment. In this finding, researchers are encouraged to search for how to apply sports massage in order to provide effectiveness in the recovery process. It is recommended that in an effort to reduce DOMS in the recovery process, a combination of several interventions is required. Further research is needed regarding what interventions or treatments are proven to reduce pain and have effectiveness in the recovery process.

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