COMPETITOR:
JURNAL PENDIDIKAN KEPELATIHAN OLAHRAGA
e-ISSN: 2657-0734 & p-ISSN: 2085-5389 ‖ Volume 18, Number 1, 2026 ‖ P.0601-0610

# The Effectiveness of Physicaltherapy Intervention For Reducing Muscle Soreness In Athletes Sepak Takraw South Sulawesi

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## ABSTRACT

Delayed Onset Muscle Soreness (DOMS) is a common musculoskeletal condition that occurs following high-intensity physical activity, particularly in sports characterized by explosive and repetitive movements such as sepak takraw. Effective management of DOMS is essential to accelerate recovery, maintain training continuity, enhance athletic performance, and reduce the risk of secondary injuries. This study aimed to examine the effectiveness of post-exercise physiotherapy interventions in reducing DOMS among sepak takraw athletes in South Sulawesi. This research employed a quantitative pre-experimental design using a one-group pretest–posttest approach. The participants consisted of 20 competitive sepak takraw athletes actively competing at provincial and national levels. Following an intense training session, participants received a multimodal physiotherapy intervention comprising ice therapy, sports massage, and stretching exercises administered within 48 hours post-exercise. The intensity of DOMS was assessed using the Visual Analog Scale (VAS) at 24 hours and 48 hours after the intervention. The results demonstrated a significant reduction in muscle soreness, with the mean VAS score decreasing from 7.04 at 24 hours post-exercise to 2.88 at 48 hours post-intervention. Statistical analysis confirmed that the observed reduction in pain intensity was significant, indicating the effectiveness of the applied physiotherapy intervention in managing DOMS. In conclusion, post-exercise physiotherapy interventions are proven to be effective in reducing DOMS in sepak takraw athletes. The routine implementation of structured physiotherapy-based recovery programs is therefore recommended to optimize recovery, support sustained performance, and minimize injury risk in competitive sepak takraw.

**ARTICLE HISTORY**
Received: 2026/01/17
Accepted: 2026/02/15
Published: 2026/02/10

**KEYWORDS**
Delayed Onset Muscle Soreness;
Physiotherapy Intervention;
Sepak Takraw;
Post-Exercise Recovery;
Athletic Performance.

**AUTHORS' CONTRIBUTION**
A. Conception and design of the study;
B. Acquisition of data;
C. Analysis and interpretation of data;
D. Manuscript preparation;
E. Obtaining funding

**Cites this Article** : Ruslan, R.; Surur, A.A.Z; Rusli, R. (2026). The Effectiveness of Physicaltherapy Intervention For Reducing Muscle Soreness In Athletes Sepak Takraw South Sulawesi. **Competitor: Jurnal Pendidikan Kepelatihan Olahraga**. 18 ( 1 ), p.0601-0610

## INTRODUCTION

Sports activities play a strategic role in maintaining fitness and health by increasing physiological, metabolic, and neuromuscular capacity (Graha & Yuniana, 2021). Sepak takraw is a rapidly growing sport in Indonesia and Southeast Asia, including within the academic environment of the Faculty of Sport and Health Sciences, Makassar State University (FIKK UNM). The achievements of FIKK UNM athletes who won gold and silver

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medals at the 21st National Games (PON) in Aceh–North Sumatra in 2024 demonstrate the high training intensity and performance demands of this sport.

Sepak takraw is a game that combines the characteristics of soccer and volleyball. It is played on a rectangular court with a net and demands high levels of eye-foot coordination, balance, and precise timing. Sepak takraw's movement patterns are fast, explosive, and repetitive over short durations, thus predominantly utilizing the anaerobic energy system (Iyakrus, 2011). Consequently, the primary component of physical condition is explosive leg muscle power, particularly in serving, smashing, and blocking (Gaffar et al., 2021).

These high mechanical and metabolic loads often trigger Delayed Onset Muscle Soreness (DOMS), in both athletes and non-athletes. DOMS is characterized by muscle pain, stiffness, and discomfort that appears 24 hours after exercise, peaks at 24–72 hours, and can last up to 5–7 days (Pearcey et al., 2015). This condition results in decreased range of motion (ROM), impaired motor function, and decreased performance quality if not managed appropriately and consistently. Therefore, DOMS management is a crucial issue in sports performance development, particularly in explosive sports like sepak takraw.

Physiologically, DOMS is no longer understood solely as a result of lactic acid accumulation. Recent research indicates that delayed onset muscle soreness is more closely related to muscle fiber microtrauma, connective tissue damage, inflammatory responses, and nociceptor activation due to eccentric mechanical stress (Contro et al., 2016; Fikri Ramdhan et al., 2024). Lactic acid only contributes to the burning sensation during intense activity and is eliminated relatively quickly after exercise, so it is not a primary cause of muscle soreness that appears one to two days later.

Various recovery interventions have been developed to address DOMS, ranging from passive to active approaches. In sports physiotherapy, frequently used interventions include sports massage, stretching, cryotherapy, self-myofascial release (SMR), and electrotherapy modalities. Empirical evidence shows that a combination of ice massage and SMR using a foam roller effectively accelerates DOMS recovery by reducing pain and increasing range of motion (Riyanto et al., 2021). Another study reported that post-exercise cooling down contributed to reduced concentrations of fatigue metabolites and faster physical recovery compared to no cooling down (Pranoto et al., 2022).

A promotive-preventive approach in sports physiotherapy is also increasingly emphasized, not only for injury rehabilitation but also for performance prevention and optimization. Systematically designed training programs integrating active recovery have been shown to reduce the risk of recurrent DOMS and maintain athletes' neuromuscular readiness (Dimas et al., 2024; Cheung et al., 2020). However, the effectiveness of each intervention is greatly influenced by the characteristics of the sport, training intensity, and the profile of the athletes being studied.

Although extensive research has been conducted on DOMS and its recovery strategies, most studies still focus on general sports such as soccer, athletics, or gym-based fitness training. Specific research on sepak takraw athletes remains very limited, particularly examining physiotherapy interventions in the context of explosive movement characteristics and leg muscle dominance. Furthermore, many studies only

evaluate one type of intervention in isolation, without comparing or integrating practical and applicable recovery approaches in a performance coaching environment.

Another limitation is the paucity of research linking the physiological mechanisms of DOMS with its impact on sepak takraw-specific movement function and performance. This contextual understanding is crucial for formulating recovery interventions that are not only clinically effective but also functionally relevant for athletes. Therefore, more targeted and evidence-based research is needed to address this gap.

Based on the existing research issues and gaps, this study aims to analyze the effectiveness of physiotherapy interventions in accelerating DOMS recovery in sepak takraw athletes, by examining its impact on muscle soreness, range of motion (ROM), and functional readiness. This research also aims to provide an empirical basis for the implementation of contextual, efficient, and applicable recovery strategies in sepak takraw performance development.

The novelty of this research lies in its specific focus on sepak takraw athletes, the integration of an active recovery-based physiotherapy approach, and the analysis of DOMS directly linked to the biomechanical and physiological characteristics of the sport. The research findings are expected to contribute to the development of sports physiotherapy and serve as a practical reference for coaches and sports health professionals in designing evidence-based, performance oriented recovery programs.

## METHODS

This study used an experimental design with a pre-experimental one-group pretest-posttest approach. The aim was to evaluate the effectiveness of a physiotherapy intervention in reducing Delayed Onset Muscle Soreness (DOMS) in sepak takraw athletes in South Sulawesi. This design was chosen because it is suitable for observing changes in subjects' condition before and after treatment in the context of competitive sports, particularly during the recovery phase following high-intensity training (Pearcey et al., 2015; Cheung et al., 2020).

### Research Subjects

The study participants consisted of 20 male sepak takraw athletes actively competing at the provincial and national levels in South Sulawesi. Inclusion criteria included: (1) athletes aged 18–25 years, (2) participating in intensive training with predominantly anaerobic and explosive characteristics, (3) experiencing DOMS symptoms after training, and (4) having no history of acute musculoskeletal injury in the past three months. Athletes undergoing medical therapy or taking analgesics during the study period were excluded. Subject selection was conducted using purposive sampling, referring to the specific characteristics of sepak takraw, which demands extreme explosive power in the leg muscles (Gaffar et al., 2021; Iyakrus, 2011).

### Research Procedures and Intervention

After a high-intensity training session designed to induce neuromuscular stress, all subjects underwent a baseline DOMS pretest. Subsequently, they were given an

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integrated physiotherapy intervention for 48 hours post-exercise, including: Ice therapy (cryotherapy) to reduce the inflammatory response and pain perception, Sports massage to improve blood circulation, reduce muscle tension, and accelerate metabolite elimination, and Active-passive stretching exercises to maintain muscle tissue elasticity and range of motion.

This combination of interventions is based on empirical evidence demonstrating the effectiveness of a multimodal approach in accelerating DOMS recovery compared to a single modality (Riyanto et al., 2021; Pranoto et al., 2022; Dupuy et al., 2018). All interventions were performed by licensed physiotherapists with standardized duration and intensity.

**Measurement Instruments and Techniques**

DOMS evaluation was conducted using the Visual Analog Scale (VAS), a valid and reliable instrument for measuring subjective pain intensity in clinical and sports contexts (Hawker et al., 2011; Bijur et al., 2019). VAS measurements were taken 24 and 48 hours after the physiotherapy intervention. This measurement time was chosen because it aligns with the peak phase of DOMS, which generally occurs 24–72 hours after strenuous physical activity (Pearcey et al., 2015).

**Data Analysis**

Data were analyzed quantitatively by comparing pretest and posttest VAS scores. Appropriate statistical tests were used to determine the significance of the reduction in muscle pain after the intervention, with a significance level set at $p < 0.05$. In addition, effect size was calculated to describe the strength of the influence of physiotherapy intervention on reducing DOMS, as recommended in evidence-based exercise research (Hopkins et al., 2009; Lakens, 2013).

## RESULTS AND DISCUSSION

**Result**

Normality test of pain data before and after intervention using *Shapirowilk* ***test*** because amount sample not enough of 50. Normality test results show mark significance ($p < 0.05$), which indicates that pain data distribution before and after intervention not normally distributed**.** Because the data is not normal, then analysis used to compare painful before and after intervention use Wilcoxon Signed-Rank Test. And the result we can see in the table below

**Table 1.**
Results of the Wilcoxon test analysis

| | **Median ( Minimum-Maximum )** | **P value Sig. (2-tailed)** |
|---|---|---|
| DOMS pain before intervention | 6.00 (5-9) | **0.000** |
| DOMS pain after intervention | 3.00 (2-4) | |

The results of the Wilcoxon test show p value = 0.000 ($p < 0.05$), which means there is significant difference between level painful before and after intervention. The distribution degree of pain before and after intervention we can show at the figure below

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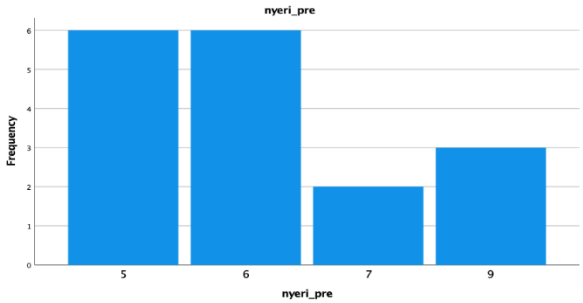


**Figure 1.**
Distribution DOMS pain before intervention

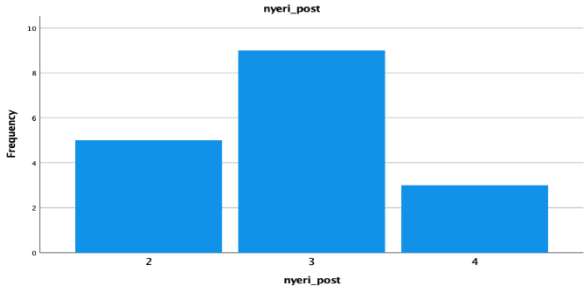


**Figure 2.**
Distribution DOMS pain after intervention

## Discussion

The results of the study showed that the physiotherapy intervention provided a significant reduction in muscle pain before and after treatment, as evidenced by a p-value <0.05 in the Wilcoxon test. This finding confirms that the physiotherapy intervention is effective in reducing pain intensity due to Delayed Onset Muscle Soreness (DOMS) in sepak takraw athletes. The selection of the non-parametric Wilcoxon test was deemed appropriate considering the subjective nature of pain data, its non-normal distribution, and the influence of various biopsychosocial factors, as commonly reported in musculoskeletal pain research (Hawker et al., 2011; Bijur et al., 2019).

Conceptually, this significant reduction in pain aligns with current understanding that DOMS is primarily caused by muscle fiber microtrauma, connective tissue damage, and the inflammatory response after eccentric contractions, rather than solely by lactic acid accumulation (Cheung et al., 2020; Contro et al., 2016). Multimodal physiotherapy interventions—including ice therapy, sports massage, and stretching—play a role in suppressing inflammation, improving microcirculation, and modulating pain perception through peripheral and central mechanisms.

The findings of this study are consistent with various previous studies reporting the effectiveness of physiotherapy interventions in reducing DOMS pain intensity. A meta-analysis by Chen et al. (2022) showed that vibration therapy significantly reduced DOMS pain perception by increasing blood flow and accelerating the removal of inflammatory metabolites. Although this study did not use vibration, the resulting physiological mechanisms are similar to those used in sports massage and active recovery, particularly in increasing tissue perfusion and reducing local edema.

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Furthermore, Guo et al. (2017) reported that massage therapy was significantly more effective in reducing DOMS pain compared to a control group without intervention. The analgesic effect of massage was associated with increased local blood flow, stimulation of mechanoreceptors, and modulation of the peripheral nervous system, which reduces pain impulse transmission. These findings reinforce the results of the current study, which found that significant pain reduction is likely influenced by the combined mechanical and neurophysiological effects of massage therapy.

Other physiotherapy interventions, such as neurodynamic mobilization, have also been reported to be effective in reducing DOMS pain and inflammation by decreasing nerve sensitivity and regulating the inflammatory response (Kachhawa et al., 2024). Although these techniques were not explicitly used in this study, the basic principles of neuromuscular and peripheral nerve modulation remain relevant, particularly in the context of explosive sports such as sepak takraw, which involve high stress on leg muscles.

From a clinical and coaching perspective, a significant reduction in DOMS pain has important implications for athletes' recovery speed and training readiness. Athletes who experience minimal pain tend to return to training more quickly, maintain movement quality, and reduce the risk of movement compensations that can potentially lead to further injury (Dupuy et al., 2018; Pearcey et al., 2015). Therefore, physiotherapy interventions can be considered a safe and effective non-pharmacological option in DOMS management, particularly in the sports performance coaching environment.

Furthermore, a multimodal approach combining manual therapy and active exercise is increasingly recommended in recent literature. Research shows that the combination of manual therapy and exercise provides superior results compared to either intervention alone in reducing pain and improving function in both acute and chronic musculoskeletal pain (Zhu et al., 2024; Hayden et al., 2005). Active exercise plays a role in improving muscle stability and function, while manual therapy helps reduce tissue tension and inflammation, thus synergistically reducing pain perception.

Electrotherapy modalities such as Transcutaneous Electrical Nerve Stimulation (TENS) are also frequently used in the management of acute and chronic pain, although their effectiveness varies depending on the type of pain and individual characteristics (Fikri et al., 2024; Akinrolie, 2025). This underscores the importance of patient education and professional consultation with a physiotherapist to ensure appropriate intervention selection and improve athlete adherence to recovery programs.

However, this study has several limitations. The relatively small sample size and the lack of a control group limit the generalizability of the results. Furthermore, this study did not evaluate the long-term effects of physiotherapy interventions on recurrent DOMS and athlete performance. Therefore, further research is recommended using a quasi-experimental or randomized controlled trial design, with a larger sample size and the addition of functional variables such as ROM, muscle strength, and sepak takraw-specific performance.

Overall, the results of this study strengthen the evidence that physiotherapy interventions play a significant role in reducing DOMS pain and supporting the recovery

process of sepak takraw athletes. These findings provide practical contributions for physiotherapists and coaches in designing evidence-based recovery strategies that are contextual, effective, and oriented toward sports performance.

## CONCLUSION

This study concluded that post-exercise physiotherapy interventions consisting of ice therapy, sports massage, and stretching administered within 48 hours of intense physical activity were effective in reducing Delayed Onset Muscle Soreness (DOMS) in sepak takraw athletes in South Sulawesi. Empirically, measurements using the Visual Analog Scale (VAS) showed a significant reduction in pain, from an average score of 7.04 at 24 hours post-exercise to 2.88 at 48 hours post-intervention, statistically indicating the effectiveness of physiotherapy interventions in accelerating muscle recovery.

Conceptually, these findings reinforce the notion that a multimodal physiotherapy approach can modulate the inflammatory response, improve tissue circulation, and reduce pain perception due to muscle microtrauma that occurs after explosive sports activities such as sepak takraw. This significant reduction in pain not only impacts the subjective comfort of athletes but also has implications for increased functional readiness, accelerated return to training, and prevention of the risk of further injury due to motor compensation.

Based on these results, routine post-exercise physiotherapy interventions are recommended as a safe and effective non-pharmacological recovery strategy in sepak takraw performance development programs. Implementation of this approach is expected to support sustainable athlete performance, optimize training adaptation, and improve the quality of evidence-based recovery management.

## ACKNOWLEDGMENT

The authors would like to express their sincere appreciation to all parties who contributed to the successful completion of this research. Special gratitude is extended to the sepak takraw athletes of South Sulawesi who voluntarily participated in this study and demonstrated a high level of commitment throughout the research process. Their cooperation and discipline were essential in ensuring the accuracy and reliability of the collected data.

The authors also acknowledge the valuable support and collaboration of physiotherapists and coaching staff who assisted in the implementation of the physiotherapy interventions and ensured that all procedures were conducted in accordance with established professional and ethical standards. Their expertise played a crucial role in maintaining the consistency and safety of the intervention protocols.

Furthermore, the authors gratefully acknowledge the Institute for Research and Community Service (LPPM) of Makassar State University for providing financial support that enabled this research to be conducted effectively. The funding support facilitated

the implementation of research activities, data collection, and analysis, thus contributing to the overall quality and scientific rigor of the study.

Finally, the authors would like to thank colleagues and academic peers who provided constructive feedback and scholarly insights during the preparation of this manuscript. All contributions, whether direct or indirect, are sincerely appreciated and have significantly enriched the completion of this research.

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