

INTERNATIONAL GRADUATE COLLOQUIUM

i-SPEAK **2026**

**SPORTS AND PHYSICAL EXERCISE
ASSEMBLY OF KNOWLEDGE SHARING**

SERIES 1. 2026

COLLOQUIUM PROCEEDINGS

EXTENDED ABSTRACT



Malaysia, 10 February 2026



eISBN 978-629-7989-01-3



The Effect of Foam Rolling and Massage Gun Therapy on Upper Limb Muscle Soreness in Rugby Players

Julia Zulaikha Zulkifli¹, Mardiana Mazaulan^{1*}, Noor Azila Azreen Md Radzi¹, Muhamad Noor Mohamed¹, Muhamad Safiq Saiful Annur¹, Mohd Aizzat Adnan¹, Raja Nurul Jannat Raja Hussain¹, & Maisarah Shari²

¹Faculty of Sports Science and Recreation, Universiti Teknologi MARA Negeri Sembilan, Seremban Campus, Malaysia

²Faculty of Sports Science and Recreation, Universiti Teknologi MARA Shah Alam, Malaysia

*Corresponding author: mardiana9840@uitm.edu.my

Keywords: Foam Rolling, Massage Gun Therapy, Upper-Limb Muscle Soreness, Rugby Players, Shoulder Range of Motion, Pain Intensity

I. INTRODUCTION

Rugby is a physically demanding contact sport that places considerable stress on the upper body through high-impact collisions, pushing, and repetitive ball handling. Delayed onset muscle soreness (DOMS), characterised by post-exercise muscle pain, stiffness, tenderness, and reduced range of motion, may impair subsequent training participation, athletic performance, and muscle recovery. Effective recovery strategies are therefore important for rugby players to maintain performance and support recovery. Foam rolling and massage gun therapy are two recovery methods commonly used in sport and fitness settings. Foam rolling is a self-myofascial release technique that applies sustained pressure to soft tissue and has been shown to reduce muscle soreness and improve flexibility. Massage gun therapy applies mechanical percussion to targeted muscle areas and may increase blood circulation, reduce muscle stiffness, and provide analgesic effects. Although both techniques are widely used for post-exercise recovery, direct comparisons of foam rolling and massage gun therapy for upper-limb muscle soreness in rugby players remain limited. Therefore, this study aimed to evaluate the effectiveness of foam rolling and massage gun therapy in reducing delayed onset muscle soreness and improving upper-limb recovery among rugby players.

II. METHODS

A. Subjects

Six male rugby players trained from the Under-19 (U19) team of Tunku Mahkota Ismail Sports School participated in this study. Participants were randomly divided into two intervention groups: the Massage Gun (MG) group ($n = 6$) and the Foam Rolling (FR) group ($n = 6$). All participants provided written informed consent prior to participation, to ensure their voluntary participation in this study. The inclusion criteria for this study were male high school rugby players who were physically fit at the time of testing, had comparable training backgrounds, and were free from upper-limb musculoskeletal injuries for at least three months prior to the study.

Participants were excluded if they had a history of shoulder or arm surgery within the previous year or had sustained a recent or current upper-limb injury within the last three months.

B. Instrumentation

Numerical Pain Rating Scale (NPRS)

Pain intensity was measured before and after the intervention using the Numerical Pain Rating Scale (NPRS). The NPRS allows for within-subject and between-group comparisons (e. g., massage gun versus foam roller) and is a 10-point scale ranging from 0 (no pain) to 10 (worst pain imaginable). The NPRS was appropriate to assess pain reduction in this study because of its ease of use, reliability, and suitability for physically active people.

Shoulder flexion

Shoulder flexion was assessed to evaluate shoulder mobility due to its importance in rugby performance. Range of motion was measured using a goniometer while participants raised the arm forward and upward with the elbow extended and the body upright. Measurements were recorded before and after the intervention to determine changes in shoulder mobility following foam rolling or massage gun therapy.

C. Procedure

Before the intervention, baseline measurements were taken, including measuring shoulder flexion range of motion (ROM) and measuring pain using the Numerical Pain Rating Scale (NPRS). Participants played a standard rugby match to induce muscle discomfort. Afterwards, they were divided into two groups. Group B received massage gun therapy (one set of 30 seconds at 40 Hz per muscle area), while Group A performed foam rolling (three sets of 60 seconds per muscle group). Immediately following treatment, post-intervention assessments were taken to assess any improvement in shoulder mobility and discomfort. At 24, 48, and 72 hours, follow-up assessments were conducted to track recovery over time.

D. Statistical Analysis

This study employed a quasi-experimental between-group design with repeated measures. Repeated measures ANOVA were used for statistical analysis. The design was selected to determine the effects of foam rolling on muscle soreness, determine the effects of massage gun therapy on muscle soreness, and compare the effectiveness of both techniques. The aim was to assess the extent to which foam rolling and massage gun therapy supported upper-limb rehabilitation in rugby players.

Prior to analysis, the dataset was screened for missing or inconsistent values, and basic data cleaning procedures were performed. Statistical analyses were conducted using JAMOVI software (version 2.3.28). Group comparisons were conducted to determine whether the players' recovery was significantly affected by the rehabilitation technique, the pre- and post-intervention scores of each group (foam rolling and massage gun) were compared using repeated-measures ANOVA. This test helped in determining whether the therapy resulted in statistically significant changes in muscle soreness and range of motion.

III. RESULTS AND DISCUSSION

The results demonstrated a significant effect of both the Foam Rolling (FR) and Massage Gun (MG) interventions on pain reduction and shoulder flexion range of motion across the time points (pre-, 24-, 48-, and 72- hours post-intervention). Further analysis revealed that the foam rolling group showed greater reductions in pain scores and greater improvements in shoulder flexion compared with the massage gun group, although both interventions produced improvements. These findings suggest that each intervention may provide specific benefits depending on the targeted outcome, highlighting the importance of selecting recovery techniques based on the desired effect on upper-limb performance and recovery.



Fig. 1 Mean Value of Pain Scale between Group FR and Group MG

Figure 1 shows differences in mean pain scores for the right and left sides between the two groups. The foam rolling group recorded lower mean scores on both sides (left = 4.62, right = 4.54) compared with the massage gun group (left = 5.62, right = 5.66),

indicating better pain reduction with foam rolling because lower scores represent less pain. Figure 2 shows that the foam rolling group achieved higher range of motion scores (left = 148.25, right = 148.25) compared with the massage gun group (left = 138.25, right = 132.25). These results indicate that foam rolling was more effective in improving shoulder range of motion.

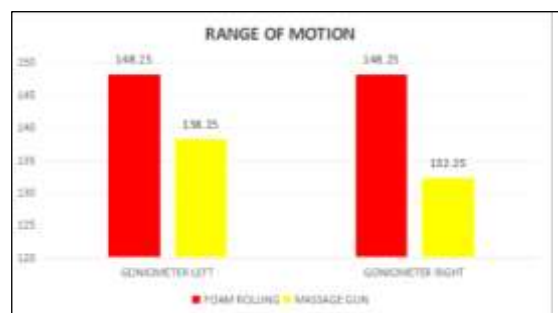


Fig. 2 Mean Value of Pain Scale between Group FR and Group MG

IV. CONCLUSIONS

Based on this study, both foam rolling and massage gun therapy showed significant effects in reducing delayed onset muscle soreness and improving upper-limb range of motion. Overall, both interventions improved recovery, but foam rolling produced better outcomes, particularly for right-side pain reduction and shoulder range of motion improvements across 72 hours.

ACKNOWLEDGMENT

Firstly, I would like to express my profound gratitude to Allah for granting me the opportunity to pursue a bachelor's degree and for guiding me through this challenging journey to its successful completion. My sincere appreciation goes to my supervisor, Mardiana, for her understanding, guidance, counsel, insightful opinions, recommendations, and consultations that were instrumental in the completion of my research project. I greatly appreciate her patience, encouragement, and willingness to provide consultations whenever needed. Her mentorship has not only enriched my academic experience but also enhanced my research skills.

REFERENCES

- [1] Ahmed, S., Jakaria, G. M., Islam, M. S., Imam, M. A., Ratul, S. K., Jahangir, R., Saha, J., Uddin, J., & Islam, M. J. (2024). The comparison of the effects of percussive massage therapy, foam rolling and hamstring stretching on flexibility, knee range of motion, and jumping performance in junior athlete: a randomised controlled trial. *Bulletin of Faculty of Physical Therapy*, 29(1). <https://doi.org/10.1186/s43161-024-00211-9>
- [2] Boguszewski, D., Krawczyk, A., Dębek, M., & Adamczyk, J. G. (2024). The effects of foam rolling applied to delayed-onset muscle soreness of the quadriceps femoris after

- Tabata training. *Biomedical Human Kinetics*, 16(1), 203–209. <https://doi.org/10.2478/bhk-2024-0021>
- [3] Chen, G., Gu, Z., Xin, D., Qi, Y., & Dai, J. (2025b). Effect of percussive massage treatment and static stretching on muscle tone, stiffness, and strength recovery after exercise-induced muscle fatigue: A randomised controlled study. *Sports Medicine and Health Science*. <https://doi.org/10.1016/j.smhs.2025.03.007>
- [4] D'Amico, A., Gillis, J., McCarthy, K., Leftin, J., Molloy, M., Heim, H., & Burke, C. (2020). FOAM ROLLING AND INDICES OF AUTONOMIC RECOVERY FOLLOWING EXERCISE-INDUCED MUSCLE DAMAGE. *International Journal of Sports Physical Therapy*, 15(3), 429–440. <https://doi.org/10.26603/ijsp20200429>
- [5] Effect of sports massage and foam rolling on muscle soreness among Negeri Sembilan Junior League U19 hockey players / Adriana Balqis Che'Ad... [et al.]. - UiTM Institutional Repository. (n. d.). <https://ir.uitm.edu.my/id/eprint/106500>
- [6] Ferreira, R. M., Silva, R., Vigário, P., Martins, P. N., Casanova, F., Fernandes, R. J., & Sampaio, A. R. (2023). The Effects of massage guns on Performance and Recovery: A Systematic review. *Journal of Functional Morphology and Kinesiology*, 8(3), 138. <https://doi.org/10.3390/jfmk8030138>
- [7] Fonta, M., Tsepis, E., Fousekis, K., & Mandalidis, D. (2021). Acute effects of static Self-Stretching exercises and foam roller Self-Massaging on the trunk range of motions and strength of the trunk extensors. *Sports*, 9(12), 159. <https://doi.org/10.3390/sports9120159>
- [8] Habscheid, C., Szikszay, T. M., & Luedtke, K. (2024). The effect of foam rolling on local and distant pain sensitivity assessed with pressure pain thresholds in healthy participants and musculoskeletal pain patients: A systematic review. *Journal of Bodywork and Movement Therapies*, 40, 786–796. <https://doi.org/10.1016/j.jbmt.2024.05.027>
- [9] Imai, T., Nagamatsu, T., Yoshizato, Y., Miyara, K., Sumizono, M., & Nakamura, M. (2024). Acute effects of handheld vibration massage on posterior shoulder soft tissues. *International Journal of Sports Physical Therapy*, 19(8). <https://doi.org/10.26603/001c.121299>
- [10] Konrad, A., Nakamura, M., Tilp, M., Donti, O., & Behm, D. G. (2022). Foam Rolling Training Effects on range of motion: A Systematic Review and Meta-Analysis. *Sports Medicine*, 52(10), 2523–2535. <https://doi.org/10.1007/s40279-022-01699-8>
- [11] Leabeater, A. J., Clarke, A. C., James, L., Huynh, M., & Driller, M. (2023). Under the Gun: Percussive massage therapy and physical and perceptual recovery in active adults. *Journal of Athletic Training*, 59(3), 310–316. <https://doi.org/10.4085/1062-6050-0041.23>
- [12] Li, H., Luo, L., Zhang, J., Cheng, P., Wu, Q., & Wen, X. (2025). The effect of percussion massage therapy on the recovery of delayed onset muscle soreness in physically active young men—a randomised controlled trial. *Frontiers in Public Health*, 13, 1561970. <https://doi.org/10.3389/fpubh.2025.1561970>
- [13] Maniatakis, A., Mavraganis, N., Kallistratos, E., Mandalidis, D., Mylonas, K., Angelopoulos, P., Xergia, S., Tsepis, E., & Fousekis, K. (2020). The effectiveness of Ergon Instrument-Assisted Soft Tissue Mobilization, foam rolling, and athletic elastic taping in improving volleyball players' shoulder range of motion and throwing performance: a pilot study on elite athletes. *Journal of Physical Therapy Science*, 32(10), 611–614. <https://doi.org/10.1589/jpts.32.611>
- [14] Naderi, A., Rezvani, M. H., & Degens, H. (2020). Foam rolling and muscle and joint proprioception after exercise-induced muscle damage. *Journal of Athletic Training*, 55(1), 58–64. <https://doi.org/10.4085/1062-6050-459-18>
- [15] Özden, F., & Yesilyaprak, S. S. (2021). Foam rolling, elbow proprioception, strength, and functional motor performance. *Journal of Athletic Training*, 56(10), 1112–1123. <https://doi.org/10.4085/445-20>
- [16] Pearcey, G. E. P., Bradbury-Squires, D. J., Kawamoto, J. E., Drinkwater, E. J., Behm, D. G., & Button, D. C. (2015). Foam rolling for delayed-onset muscle soreness and recovery of dynamic performance measures. *Journal of Athletic Training*, 50(1), 5–13. <https://doi.org/10.4085/1062-6050-50.1.01>
- [17] Pahlevi, R., Rusdiana, A., Haryono, T., Hidayat, I. I., & Kurniawan, T. (2024). Effectiveness of massage gun and foam roller methods on fatigue recovery in football athletes. *Halaman Olahraga Nusantara: Jurnal Ilmu Keolahragaan*, 7(2), 1–14. <https://doi.org/10.31851/hon.v7i2.16339>
- [18] Roberts, T. D., Costa, P. B., Lynn, S. K., & Coburn, J. W. (2024). Effects of Percussive Massage Treatments on Symptoms Associated with Eccentric Exercise-Induced Muscle Damage. *Journal of Sports Science and Medicine*, 126–135. <https://doi.org/10.52082/jssm.2024.126>
- [19] Sams, L., Langdown, B. L., Simons, J., & Vseteckova, J. (2023). The Effect of percussive therapy on Musculoskeletal performance and Experiences of Pain: a systematic literature review. *International Journal of Sports Physical Therapy*, 18(2), 309–327. <https://doi.org/10.26603/001c.73795>
- [20] Trainer, J. H., Pascarella, M., Paul, R. W., & Thomas, S. J. (2022). Acute effects of percussive therapy on the posterior shoulder muscles differ based on the athlete's soreness response. *International Journal of Sports Physical Therapy*, 17(5). <https://doi.org/10.26603/001c.37254>
- [21] Wiewelhove, T., Döweling, A., Schneider, C., Hottenrott, L., Meyer, T., Kellmann, M., Pfeiffer, M., & Ferrauti, A. (2019b). A Meta-Analysis of the effects of foam rolling on performance and recovery. *Frontiers in Physiology*, 10. <https://doi.org/10.3389/fphys.2019.00376>
- [22] Zuraimy, M. H. (2021). The effects of foam rolling vs massage as recovery tools towards UiTM Perlis FC. *Universiti Teknologi MARA*. Retrieved from <https://ir.uitm.edu.my/id/eprint/43692>