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Effectiveness of Foam Rolling and Massage Gun on Muscle Soreness (DOMS) Among Rugby Players

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I. Introduction

Delayed onset muscle soreness (DOMS) is a well-known condition that affects athletes following intense or unfamiliar physical activity. It is characterised by muscle pain, stiffness, and reduced range of motion, typically appearing 24 to 48 hours after exercise and peaking within 72 hours [1]. In rugby, a high-impact contact sport involving repeated sprinting, tackling, scrummaging, and rapid changes of direction, lower-limb muscles such as the quadriceps, hamstrings, and calves are particularly susceptible to DOMS [2]. If left unmanaged, DOMS can impair athletic performance, reduce training quality, and increase injury risk.

Among recovery strategies used to manage DOMS, self-myofascial release techniques have become increasingly popular. Foam rolling (FR) involves applying pressure through a cylindrical foam device to tight or sore muscle groups, promoting circulation and reducing fascial tightness [3]. Massage guns (MG), newer percussive therapy devices, deliver rapid vibration pulses directly into muscle tissue to achieve similar effects [4]. Although both tools are widely adopted in athletic settings, comparative research on their effectiveness, especially among rugby players, remains limited.

This study aimed to investigate and compare the effects of foam rolling and massage gun therapy on muscle soreness and range of motion in lower-limb muscles among university-level male rugby players, with the goal of providing evidence-based recovery guidance for athletes and practitioners.

II. Methods

A quasi-experimental research design was used in this study. A total of 20 male rugby players aged 18 to 30 years from Universiti Teknologi MARA (UiTM) Seremban 3 were recruited using purposive sampling. Participants were randomly divided into two groups of 10: a foam rolling group and a massage gun group. Inclusion criteria required participants to be actively training and free from lower-limb injuries for at least six months.

Both interventions were applied immediately after a rugby match simulation targeting the lower-limb muscles, including the quadriceps, hamstrings, and calves. The foam rolling protocol was adapted from [5], in which participants rolled each muscle group for 45 seconds, with 15 seconds of rest, over two sets of four repetitions. The massage gun protocol followed [6], with a round ball attachment applied at 50 Hz for the quadriceps and hamstrings and 30 Hz for the calves, for 5 minutes per leg. Muscle soreness was measured using the Visual Analogue Scale (VAS), rated from 0 (no pain) to 10 (severe pain). Range of motion (ROM) was assessed through active knee extension measured with a goniometer. Measurements were taken at baseline (pre-test), 24 hours, 48 hours, and 72 hours after the intervention. Data were analysed using descriptive statistics, Shapiro-Wilk normality tests, and repeated-measures ANOVA with Bonferroni post hoc comparisons via Jamovi software (version 2.6.4).

III. Results and Discussion

The results demonstrated a significant effect of both foam rolling (FR) and massage gun (MG) interventions on lower-limb pain scores and lower-limb range of motion (ROM) across the four time points: pre-test, 24 hours, 48 hours, and 72 hours post-intervention. Further analysis revealed that the FR group showed greater improvement in right lower-limb pain reduction, while the MG group achieved better results in right lower-limb range of motion recovery. These findings suggest that each intervention may offer specific benefits depending on the targeted lower-limb performance outcome and the side assessed.

Figure 1 illustrates the mean pain scores for both the left and right lower limbs between the two intervention groups. For the left lower limb, the foam rolling (FR) group recorded a slightly higher mean pain score (M = 4.90) than the massage gun (MG) group (M = 4.65), indicating that the massage gun was marginally more effective in reducing muscle soreness on the left side. In contrast, for the right lower limb, the FR group achieved a lower mean pain score (M = 4.66) than the MG group (M = 5.83), suggesting that foam rolling was more effective in alleviating pain on the right side. Since lower pain

scores reflect greater reductions in muscle soreness, these findings indicate that both interventions were effective overall, but their relative effectiveness differed by limb.

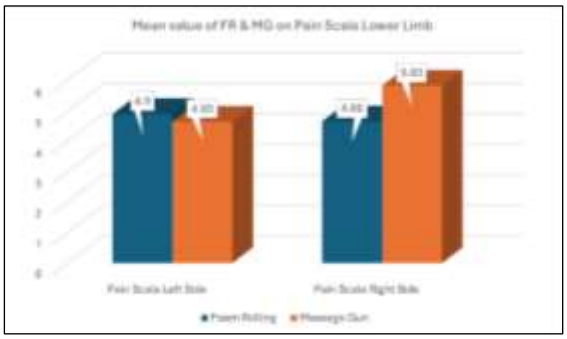


Fig.1 Mean Value of FR and MG on Pain Scale

Figure 2 shows the mean ROM values for both lower limbs between the two groups. On the left side, the FR group recorded a mean of 25.43 degrees, while the MG group recorded 25.58 degrees. The difference between groups was very small, indicating that both methods produced similar outcomes for left-side joint mobility. On the right side, however, the difference was more apparent.

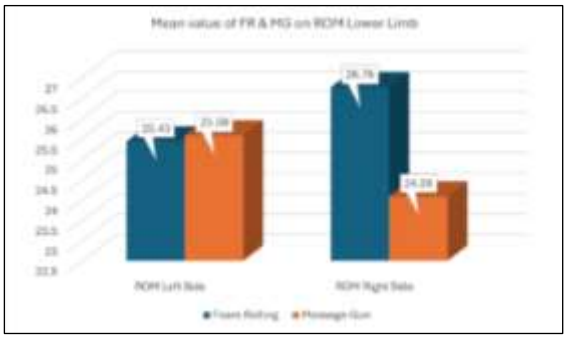


Fig.2 Mean Value of FR and MG on ROM

The FR group had a mean of 26.76 degrees, while the MG group recorded a lower mean of 24.08 degrees. In the active knee extension test, a lower degree reading indicates better muscle flexibility and recovery. Therefore, the MG group showed a stronger recovery response on the right side. Overall, these results suggest that massage gun therapy may be more helpful than foam rolling for recovering right lower-limb flexibility.

IV. Conclusions

In conclusion, both foam rolling and massage gun therapy are effective recovery strategies for managing DOMS among university rugby players. Both interventions led to significant reductions in muscle soreness and improvements in range of motion over a 72-hour recovery period. Although no consistent superiority was found between the two methods, each showed minor advantages in specific outcomes. Foam rolling may offer slightly greater pain relief, while massage gun therapy may provide marginally better ROM recovery. These findings support the use of either method as a practical, evidence-based recovery tool for rugby athletes, with selection based on availability, preference, and specific recovery goals.

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