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EXTENDED ABSTRACT

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COMPARATIVE ANALYSIS OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION STRETCHING VERSUS FOAM ROLLING ON POST-EXERCISE MUSCLE SORENESS AND FUNCTIONAL RECOVERY IN UNIVERSITY-LEVEL FUTSAL

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I. Introduction

Muscle soreness can hinder athletic performance and recovery. This study examines the effects of Proprioceptive Neuromuscular Facilitation (PNF) stretching and foam rolling on muscle soreness among UiTM Negeri Sembilan futsal players. By identifying and comparing these methods' effectiveness, this research addresses critical gaps in understanding safe, effective recovery strategies and provides insights into optimizing post-exercise care [1].

II. Methods

Ten UiTM Negeri Sembilan futsal players, engaging in regular physical activity, participated in this study. Participants were instructed in proper techniques for PNF stretching and foam rolling sessions in 15 minutes targeting quadriceps, hamstrings, adductors, glutes and gastrocnemius muscles. Muscle soreness was assessed using sit-to-stand tests (pain scale), knee extensor (pain scale), and knee flexion (range of motion) across the five-time frames: pre-training, immediately post-training, 24, 48, 72 hours post-training.

III. Results

All the results presented that there was a significant effect of PNF stretching and foam rolling group for all the biomarkers which are pain scale (PS) and range of motion (ROM) between the five-time series. Figure 1,2 and 3 showed the mean value of PNF and FR follow sit to stand and knee extensor (pain scale) and knee flexion (range of motion) that conclude was significantly different at pain scale measurement test and not significant at range of motion measurement test. This proposes that there was a change in all the biomarkers between the interventions across the five-time series.

TABLE I
P-value and Effect Sizes (Eta Square) for Performance Scores (Sit-to-stand, Knee Extensor and Knee Flexion)

Effect	*p*	Eta Square
Sit to Stand (PS)	<.001	0.793
Knee Extensor (PS)	<.001	0.768
Knee Flexion (ROM)	0.048	0.043

A. Sit to Stand

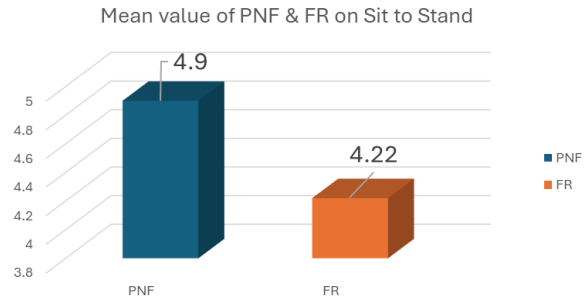

Fig. 1 Mean value of PNF and FR on Sit to Stand (STS)

B. Knee Extensor

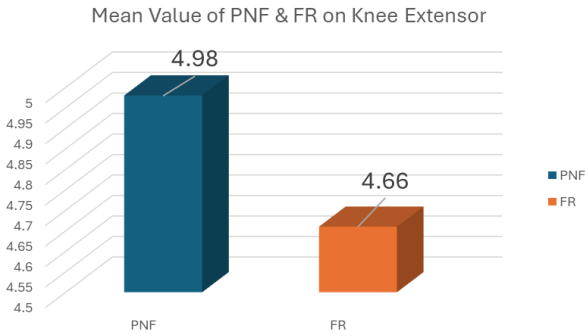

Fig. 2 Mean value of PNF and FR on Knee Extensor (KE)

C. Knee Flexion

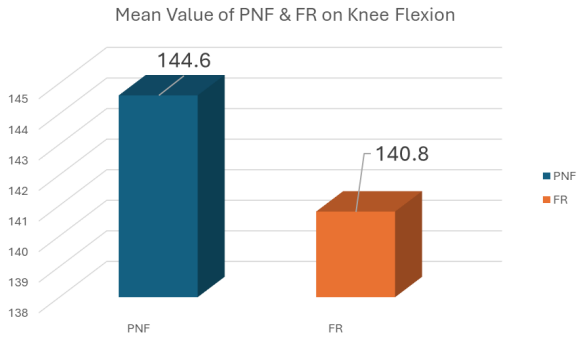

Fig. 3 Mean value of PNF and FR onKnee Flexion (KF)

Figure 1 shows each intervention has changed which was a decrement for a five-time series. From the mean (M) value, it showed that PNF group has the highest value for Sit to Stand which was 4.9 while FR group has the value of 4.22 respectively. Figure 2 demonstrates each intervention has changes which were a decrement of the knee extensor for a five-time period. From the mean (M) value, it showed that PNF group has the highest value for knee extensor which is 4.98 compared to FR has the value of 4.66. Figure 3 presents the mean value of Knee Flexion between PNF and FR. According to the data, it showed that PNF group has a highest value which is 144.6 compared to FR has the value 140.8. Based on the current study, it showed that there was a significant effect on both intervention towards sit to stand, knee extensor and knee flexion. However, the result also showed that there is a significant difference effect for both interventions at sit to stand and knee extensor only. It can be concluded that FR was the best intervention overall for the futsal players to reduce muscle soreness after a match.

IV. Discussion

The purpose of this study was to compare the effects of PNF and Foam Roller on muscle soreness among UiTM Negeri Sembilan futsal players. The PNF stretching and Foam Roller treatment are used to enhance recovery for the futsal players. These interventions have given the effects towards two biomarkers in the body, which are pain scale (PS), knee range of motion (ROM). These interventions gave a decrease in terms of PS and an increase in terms of ROM, which was based on the recovery time of the player.

Based on the results, PNF was found to be more effective in reducing pain. Previous studies demonstrate that PNF effectively modulates nociceptive input, leading to a decrease in pain sensitivity. Their findings attributed this to the activation of the Golgi tendon organs, which regulate muscle tension and promote relaxation [2]. PNF also can improve ROM through the activation of Golgi tendon organs, which help regulate muscle tension and prevent overstretching [3].

Furthermore, Foam Roller (FR) found that foam rolling on individuals with chronic and acute musculoskeletal pain and highlighted that while some trials reported significant pain reduction when foam rolling was combined with therapeutic exercise protocols, the overall evidence was inconclusive, indicating a need for further research [4]. FR demonstrates that significantly increases ROM without compromising muscle performance, suggesting its utility in athletic warm-up routines [5].

Additionally, both PNF and FR demonstrated significant effects on reducing pain and enhancing range of motion. Based on this study's finding, both interventions are equally effective and can be utilized as recovery strategies to reduce muscle soreness following matches.

V. Conclusion

Foam rolling proved more effective than PNF in reducing muscle soreness and enhancing recovery among UiTM Negeri Sembilan futsal players. Both interventions demonstrated significant improvements in pain scale and range of motion, but foam rolling consistently showed better results, making it a recommended post-match recovery method.

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