Effectiveness of Active Release Technique Versus Foam Rolling on Hamstring Tightness in Drivers

Mr. Yahoshava Suhas Salve[1], Dr. Chandrakant Patil[2], Dr. Chandrakant Patil[3]
[1]*B. P. Th, Krishna College of Physiotherapy, Krishna Vishwa Vidyapeeth, Karad, Maharashtra, India*
[2,3]*Assistant Professor, Department of Cardio Pulmonary Sciences, Faculty of Physiotherapy, Krishna Vishwa Vidyapeeth, Karad, Maharashtra, India*

Abstract- Background: Drivers are prone to developing hamstring tightness due to prolonged sitting, which contributes to muscle shortening, decreased flexibility, and increased risk of lower back pain. Effective interventions are essential to reduce musculoskeletal dysfunction and improve functional mobility in this occupational group. The present study aimed to compare the immediate effects of the Active Release Technique (ART) versus Foam Rolling (FR) on hamstring tightness among professional drivers.

Methodology: A total of 40 male car drivers from the Pune district, with over one year of driving experience and a daily sitting duration of 6–8 hours, were randomly assigned to two groups (ART and FR). Hamstring tightness was assessed pre- and post-intervention using the Active Knee Extension (AKE) test. Group A received ART targeting the hamstring and related muscles, while Group B underwent FR sessions. Range of motion (ROM) improvements were measured and statistically analyzed using paired t-tests.

Results: The ART group showed a significantly higher mean improvement in knee extension ROM (10.2°) compared to the FR group (5.6°). Percentage improvement in ROM was 38% for ART and 21% for FR. Additionally, 70% of participants in the ART group demonstrated ≥10° improvement versus only 20% in the FR group. The difference between pre- and post-intervention ROM was statistically significant in both groups, with greater significance in the ART group (p=0.0001) than in the FR group (p=0.003).

Conclusion: Both ART and FR are effective in reducing hamstring tightness in drivers; however, ART yields superior immediate improvements in flexibility. ART may be considered a more effective intervention for managing occupational hamstring tightness and enhancing musculoskeletal health among drivers. Further research is recommended to explore long-term effects and functional benefits.

INTRODUCTION

Drivers often face unique challenges when it comes to maintaining physical comfort during long drives. Hamstring tightness is a widespread complaint among drivers, often resulting from long periods of sitting, which leads to muscle shortening, reduced flexibility, and increased risk of lower back pain[1]. The hamstrings play a crucial role not only in mobility but also in maintaining pelvis stability. Individuals with prolonged sitting are at higher risk of developing musculoskeletal disorders, these disorders considerably affect work-related matters in various occupational groups, leading to higher compensation and healthcare expenses, decreased productivity, and a lower quality of life[2]. Millions of cab drivers in nations like India, where they work long hours, have developed musculoskeletal conditions like hamstring tightness, which may have affected their overall driving performance and resulted in difficulties[3]. Prolonged sitting, as experienced by drivers, places significant stress on the musculoskeletal system, with the hamstrings being among the most affected muscle groups. over time, this can lead to muscle stiffness, reduced blood flow, and the formation of adhesions[4]. The hamstrings are a group of three muscles—the biceps femoris, semitendinosus, and semimembranosus, Their primary functions include knee flexion and hip extension[5]. Sitting for extended periods of time can cause the pelvis to shift, causing a posterior pelvic tilt and 90-degree knee flexion, which can shorten the hamstring muscles[6]. It has also been found that hamstring muscle strain is one of the risk factors leading to low back discomfort in patients, particularly those who drive constantly for hours. The typical hip flexion and knee flexion posture that drivers maintain while driving causes them to develop hamstring tightness.

When using pedals, uneven loading patterns take place. The compensating patterns that emerge during vehicle operation are in reaction to micro-movements and vibration[7]. The Active Release Technique (ART), created by Dr. P. Michael Leahy, is designed to treat a range of problems involving

muscles, tendons, ligaments, fascia, and nerves. ART sessions utilize focused tension combined with specific movements. This active component, where the patient participates in the treatment through controlled movement, distinguishes the Active Release Technique from passive modalities and is believed to enhance its effectiveness in restoring normal tissue function and movement patterns[8]. The targeted nature of the Active Release Technique makes it particularly valuable for drivers, as it can address the specific patterns of tissue dysfunction that develop from their occupational demands. Foam Rolling (FR) is a self-myofascial release (SMR) technique that is performed with a cylindrical roller designed to ease muscle tension and enhance flexibility. Foam rolling involves applying pressure to targeted muscle groups to increase blood circulation, reduce muscle adhesions, and improve tissue elasticity. The repetitive pressure applied through the foam roller encourages a gradual restoration of suppleness in the softened soft tissues, thereby increasing the range of motion and reducing discomfort[9].

MATERIALS AND METHODS

After obtaining approval from the Institutional Human Ethics Committee of Krishna Vishwa Vidyapeeth, this study was carried out to find the effectiveness of the Active release technique versus Foam rolling on hamstring tightness in drivers. The participants were chosen based on specified inclusion and exclusion criteria, which are given below. 40 male drivers in the Pune district with work experience of more than 1 year were taken through a purposive sampling technique and randomly divided into two equal groups. All the participants were informed about the study protocol, and their rights before providing the written consent form. After filling out the consent form the participant's Active Knee extension test was performed to check for Hamstring tightness. Group A received Active Release Technique and Group B received foam rolling. An active knee extension test was used to measure post-intervention Range of motion measurements.

INCLUSION: -

1. Car drivers engage in 6 to 8 hours of sitting daily.
2. Work experience more than 1 year.
3. Working at least 5 days per week.

EXCLUSION: -

1. History of lower limb trauma.
2. Recent surgeries in the lower back and lower limb within the past 6 months.
3. Participation in gym and sports activities.

Outcome Measure: Active Knee Extension Test (AKE) Active Knee Extension test: The participant was positioned supine with hip and knee flexed at 90°. Using a universal goniometer, knee range of motion (ROM) or popliteal angle was measured. The fulcrum of the goniometer was centered over the lateral joint line of the knee, with the proximal arm parallel to the femur and the distal arm parallel to the tibia. The participant was instructed to actively extend the knee until a mild stretch sensation was felt in the hamstrings. Subsequently, a universal goniometer was employed to measure the angle of end-range knee extension.

Intervention:

- Group A:- The participant underwent a session of the Active Release Technique on the dominant side, involving a three-step process. Step 1: The subject lay supine on the plinth, and gentle tension was applied to the hamstring muscle along its entire length while varying leg positions to optimize muscle engagement. Step 2: Included the application of gentle tension at both the origin and insertion points of the hamstring muscle. Step 3: Gentle tension was applied around the adductors and gluteus muscles, considering their connection to the hamstring and their potential contribution to hamstring tightness. This cycle is repeated 3 times.
- Group B:- The participant underwent a session of Foam Rolling (FR) on the dominant side. This involves the application of a foam roller to the hamstring for 30-40 seconds, followed by rest, repeated for 3 cycles. The session began with the participant seated on the foam roller, supporting their body weight with hands on the ground, the dominant leg in contact with the foam roller, and the non-dominant leg in a figure-of-four position on top of the dominant leg. The rolling motion involved moving back and forth from the knee upwards towards the thigh, reaching the gluteal region, with a focus on tight muscle areas.

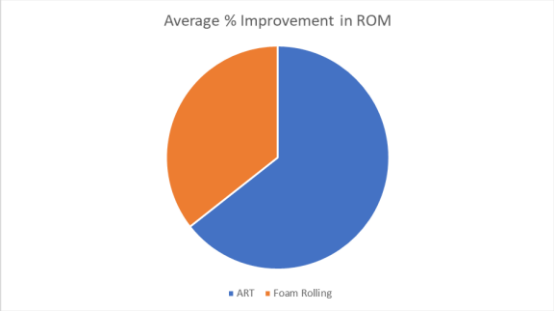
RESULT

1. Age-Wise Distribution (Table 1)

Age Group	ART (n)	Foam Rolling (n)	Mean Improvement (°) – ART	Mean Improvement (°) – Foam Rolling
20–29	5	5	10.1°	6.2°
30–39	7	7	9.6°	5.8°
40–49	8	8	8.7°	5.0°

Interpretation: Age-wise analysis showed that the highest improvement in ROM post-treatment was observed in the 20–29 age group for both ART and Foam Rolling, with ART showing superior gains across all age brackets.

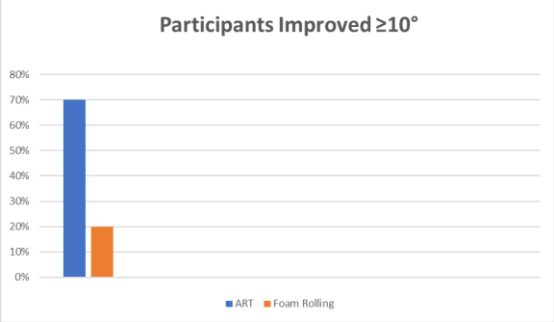
2. Percentage Improvement (Table 2)



Group	Average % Improvement in ROM
ART	38%
Foam Rolling	21%

Interpretation: Percentage improvement in ROM revealed that ART led to an average (38%) improvement in extension lag, nearly double that of Foam Rolling (21%).

3. Number of Participants Showing ≥10° Improvement (Table 3)



Group	Participants Improved ≥10°	% of Group
ART	14	70%
Foam Rolling	4	20%

Interpretation: 70% of participants in the ART group showed ≥10° improvement in ROM, compared to only 20% in the Foam Rolling group.

4. Pre-Post Comparison Using Paired Data (Table 4)

Group	Mean Pre-ROM (°)	Mean Post-ROM (°)	p-value
ART	26.5°	16.3°	0.0001
Foam Rolling	26.8°	21.2°	0.003

Interpretation: In the ART group, the mean pre-treatment ROM was 26.5°, which significantly improved to 16.3° post-treatment. The p-value of 0.0001 indicates that this improvement is highly statistically significant. In the Foam Rolling group, the mean pre-treatment ROM was 26.8°, which improved to 21.2° post-treatment. This change is also statistically significant ($p = 0.003$), though less pronounced compared to ART.

DISCUSSION

The present study aimed to evaluate and compare the immediate effects of Active Release Technique (ART) and Foam Rolling (FR) on hamstring tightness in professional drivers. The results demonstrated a statistically significant improvement in the range of motion (ROM) in both groups, with ART proving to be more effective than FR. Drivers, due to their prolonged sitting postures and restricted movements, are especially prone to hamstring tightness, which not only impairs lower limb function but also contributes to lower back discomfort and compromised driving performance[1][2]. This occupational hazard is especially prevalent in countries like India, where cab drivers often work extended hours, increasing the risk of musculoskeletal disorders[3]. Prolonged sitting promotes posterior pelvic tilt and sustained knee flexion, both of which contribute to shortening of the hamstring muscles and reduced mobility[4][6].In the current study, ART demonstrated superior results in all outcome

parameters, including average improvement in degrees of knee extension, percentage improvement in ROM, and the number of participants achieving clinically significant gains. These findings support previous research that emphasizes ART's effectiveness in improving flexibility and reducing soft tissue tension through a combination of movement and targeted manual pressure[8]. ART's active participation component, where the patient engages in specific movement patterns during therapy, likely contributed to the enhanced outcomes by promoting neuromuscular re-education and tissue remodeling.

Foam rolling, on the other hand, also showed statistically significant improvement, albeit less than ART. This is consistent with existing literature which supports foam rolling as an effective self-myofascial release technique for improving flexibility and reducing delayed onset muscle soreness[9]. However, the passive nature of foam rolling and the generalized pressure applied may limit its ability to address deeper adhesions and tissue restrictions compared to ART.

Age-wise analysis in the study revealed that younger participants (20–29 years) benefited more from both interventions, possibly due to greater tissue elasticity and responsiveness to manual therapy. Similar trends were reported by Ayeni et al., who found that younger drivers had better recovery profiles and muscle adaptability than older age groups[1]. The high percentage of participants in the ART group (70%) showing ≥10° improvement compared to the FR group (20%) further highlights ART's clinical relevance, particularly for occupational groups like drivers who require quick and effective interventions to maintain work performance and reduce the risk of long-term disability.

CONCLUSION

The present study concludes that both the Active Release Technique (ART) and Foam Rolling (FR) are effective in reducing hamstring tightness in professional drivers; however, ART demonstrates significantly greater improvement in range of motion compared to Foam Rolling. The results highlight that ART, through its targeted and active approach, is more effective in releasing muscle adhesions, improving tissue flexibility, and enhancing functional mobility. Given the occupational demands placed on drivers and the high prevalence of hamstring tightness due to prolonged sitting, incorporating ART into regular physiotherapy practice may provide more substantial and immediate relief. Future studies with larger sample sizes and long-term follow-up are recommended to validate and expand on these findings.

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