IJBPAS, June, 2026, 15(6): 2943-2951

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

EFFECT OF DYNAMIC SOFT TISSUE MOBILIZATION VERSUS FOAM ROLLING ON HAMSTRING FLEXIBILITY IN COLLEGE-LEVEL FOOTBALL PLAYERS: A COMPARATIVE STUDY

KAVITA P[1*], POOJA V[2] AND GAURAV P[3]

1: [1]2nd year, Master in Physiotherapy, Department of Musculoskeletal and sports science, Ahmedabad Physiotherapy College, Parul University, Gujarat, India

2: Assistant Professor, Master in Musculoskeletal and sports, Ahmedabad Physiotherapy College, Parul University, Gujarat, India; **Orcid Id:0009-0001-0688-4906**

3: Principal, Master in Neuroscience, Ahmedabad Physiotherapy College, Parul University, Gujarat, India; **Orcid Id: 0000-0002-7741-1786**

***Corresponding Author: Dr. Kavita Pal: E Mail: palkavita8010@gmail.com**

Received 16th May 2025; Revised 18th June 2025; Accepted 20th Sept. 2025; Available online 1st June 2026

https://doi.org/10.31032/IJBPAS/2026/15.6.10284

ABSTRACT

Background: Football players are susceptible to musculoskeletal problems, particularly in the lower limbs, because the sport demands a lot of speed, strength, and agility. About 17% of football-related injuries are hamstring strains, which are frequently associated with tight muscles and limited flexibility. When sprinting, the hamstrings are under a lot of strain, particularly during the terminal swing phase when they have to contract eccentrically. DSTM targets tense muscles by combining massage and movement, while SMFR (using foam rollers) promotes blood flow and lessens fascial limitations. These techniques might enhance performance and flexibility. This study examines how they affect collegiate football players' hamstring function and flexibility.

Methodology: A comparative study was conducted on 44 male college football players aged 20–28 years with hamstring tightness (<20° AKE). Participants were randomly assigned to Group A

(DSTM) or Group B (Foam Rolling), receiving interventions 3 times a week for 4 weeks. The AKE test was used as the outcome measure. Statistical analysis included paired and independent t-tests with significance set at $p<0.05$.

Result: Both groups showed significant improvement in hamstring flexibility. Group A (DSTM) had a mean improvement of 3.2° (9.8%), while Group B (FR) showed a higher improvement of 5.1° (15.4%) with a statistically significant difference (p=0.001).

Conclusion: Both DSTM and Foam Rolling are effective in improving hamstring flexibility. However, Foam Rolling is more effective and can be recommended as a preferred intervention for enhancing flexibility in collegiate football players.

Keywords: Flexibility, Hamstring muscle tightness, Foam roller, Dynamic soft tissue mobilization, Footballer

INTRODUCTION

The most popular high-intensity intermittent team sport that calls on endurance, strength, speed, and agility is football. In official football matches, top players engage in 150–250 brief, high-intensity, energy-demanding movements, punctuated by low-intensity running or jogging intervals. Athletes may withdraw from training and competition, incur significant financial losses, and have their performance adversely impacted by musculoskeletal injuries, which are among the most serious health issues in sports medicine because team sports are taxing activities **[1]**. The biceps femoris (short head) arise from the lateral condyloid ridge of the posterior femur and the Linea aspera, while the hamstrings originate from the ischial tuberosity. The two-joint muscle bulk of the hamstrings is made up of the semimembranosus and semitendinosus, which create the medial mass, and the long and short heads of the biceps femora, which form the lateral mass. Running uses the hamstring muscles for three purposes **[2]**.

The terminal swing and beginning stance of the sprinting cycle are when the hamstrings are most active during the gait cycle. The hamstrings must stretch and contract aggressively during the terminal swing phase in order to slow the extending knee and flexing hip. The second portion of the sprinting swing phase involves an active stretch-shortening cycle of the biarticular hamstrings. On the other hand, during over ground sprinting, the greatest torques for knee flexion and hip extension are observed to happen during ground contact. On the other hand, adolescent sports engagement and physical activity are linked to a higher risk of

musculoskeletal problems.60–75% of the injuries sustained by high school athletes are lower extremity injuries, which make up a significant fraction of these injuries **[1]**.

According on sport modality, the prevalence of injury types and locations varies, ranging from 5–60% for joint injuries, 20–60% for muscle injuries, and 10–50% for tendinopathy. A lack of flexibility and tight muscles have been linked to about 17% of football injuries; hamstring tightness is associated with a higher risk of non-contact injuries. Given how important it is for collegiate football programs to manage players' body weight, body composition, muscular strength, and length, this study looked at the potential effects of hamstring flexibility on collegiate football players' functional performance **[1]**.

Soft tissue mobilization (DSTM) is a useful treatment for reduced muscular flexibility. Muscle lengthening is achieved by the soft tissue method known as dynamic soft tissue mobilization (DSTM).It works well on the targeted tight muscle area by fusing the dynamic element of the technique with the traditional massage method **[3]**.

Manual therapy, which is based on the results of applying mechanical pressure to soft body tissue, includes SMFR. Both terms are frequently used interchangeably since the mechanism underlying SMFR is the same as that which may be induced during self-massage. The purpose of the rollers is to stretch and provide pressure to the fascia **[4]**. Soft tissue from abnormally tight fascia is released with a foam roller in the self-myofascial release technique. The person's weight is the source of pressure when utilizing a foam roller. When the muscle experiences high and sustained strain, the Golgi tendon organ senses a change in tension and reacts by causing the muscle spindles to relax. Due to the friction produced by the rolling motion and the simultaneous tissue stretch brought on by the pressure of the person’s body weight, that using a foam roller warms up the muscles and fascia. Foam rolling has been hypothesized to improve range of motion by releasing fibrous adhesions in the fascia, allowing the muscle to glide more freely. Thixotropic, a physical characteristic of muscle and tissue, is observed in the muscle and fascia. Connective tissue fascia may be able to change from a thickened to a liquid state by the application of force, Force is produced within the soft tissue by applying pressure with foam rolling in the direction of the muscle. Because the thixotropic feature reduces tissue resistance, it also exhibits a change in the properties of muscles and fascia **[5]**.

In the treated area, which has undergone pathological alterations due to strain, traumatic motions, metabolic imbalance, or even psychological factors, this promotes histological tissue changes. The goal is to eliminate symptoms such as pain and decreased range of motion, which are known as fascial regulations and adhesions **[4]**. Foam rolls are solid foam cylinders that come in a variety of sizes and hardness levels. The pressure applied by the foam roll reduces muscular tension and activates the Golgi tendon unit. An additional potential consequence could be enhanced tissue hydration. As soft tissue is compressed during work, it becomes saturated with fluid, improving movement between the various fascial layers and raising blood flow and temperature. Foam rolling is to decrease scar tissue and remove fascial adhesions. Furthermore, the foam roll enhances muscular performance and speeds up regeneration **[9]**.

MATERIALS AND METHEDOLOGY

- **Study design**: Comparative study
- **Sampling technique**: simple random sampling.
- **source of data:** Ahmedabad
- **Sample size**: 44
- **Study duration**: 1 year
- **Duration of the intervention**: 3 days /week for 4 weeks.
- **Study population**: college level football players.
- **MATERIALS**: pen, paper, consent form, standard goniometer.

INCLUSION CRITERIA [6, 7]

- Age: Between 20-28-year, male
- Players with hamstring tightness.
- Participants who are willing to participate.

EXCLUSION CRITERIA [8]

- Any history of lower extremity injury in past 3 months,
- Subjects involving in any sports and gymnasium activity,
- Acute or chronic hamstrings strain, limb length discrepancy and low back pain,
- Any neurological condition.

OUTCOME MEASURES [1]

- Active knee extension test

- Each participant was informed about the study methodology and written consent form was filled by all the participants and then detail assessment was taken the procedure was explained properly than was filled up by the participants and confidentiality of the data was assured.

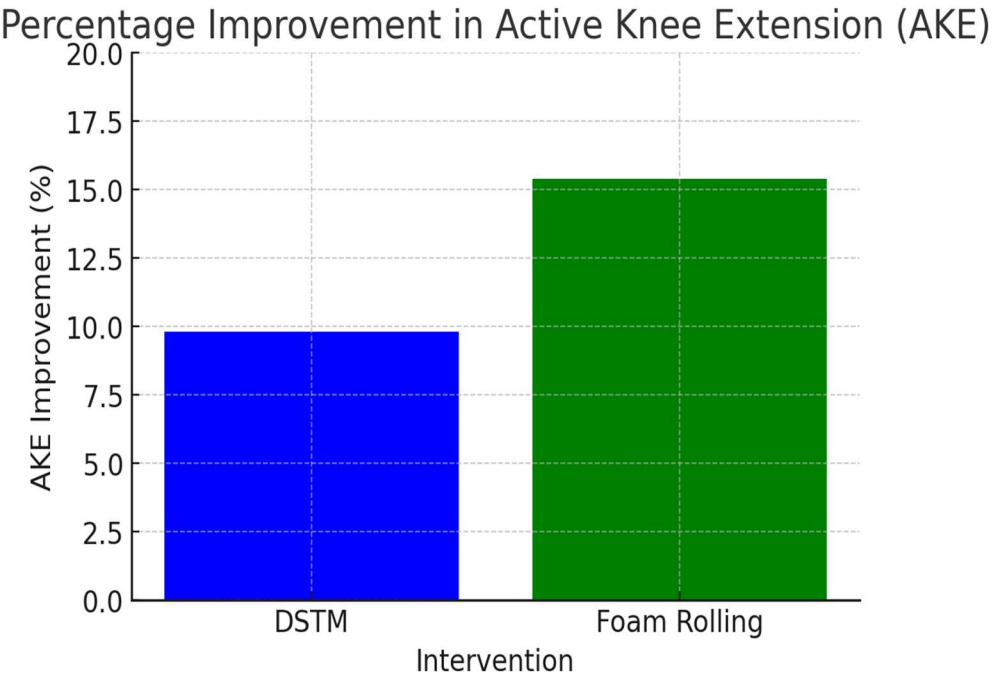
STATISTICAL ANALYSIS

- Normalative data was found using Shapiro-Wilk test.
- Paired t-test was used to analyze intra-group differences.
- Independent t-test compared inter-group differences.
- Version 20.0 of SPSS software was used for the statistical analysis. P<0.05 was considered significant for all measurements. P>0.05 was considered non-significant.
- Value of confidence interval was set at 95%.
- P< 0.01 was considered highly significant.
  P<0.001 was considered highly significant.

RESULT AND DISCUSSION

- The study analyzed the pre- and post-intervention AKE values, assessing improvements in flexibility.

Measure	Group A (DSTM)	Group B (Foam Rolling)	p-value
Pre-Intervention AKE (°)	**32.5 ± 2.1**	**33.1 ± 2.4**	**0.65**
Post-Intervention AKE (°)	**35.7 ± 2.0**	**38.2 ± 2.3**	**0.001**
Mean Improvement (°)	**+3.2**	**+5.1**	**0.001**
% Change in AKE	**+9.8%**	**+15.4%**	**0.001**



- Mean age :25.7 ± 3.0 years.
- This study assessed the effect of dynamic soft tissue mobilization versus foam rolling on hamstring flexibility in college level football players. Both DSTM and Foam Rolling significantly improved hamstring flexibility.
- Foam Rolling demonstrated a greater increase in AKE (15.4% vs. 9.8%).

DISCUSSION

This study compared the effects of foam roller exercise and dynamic soft tissue mobilization on hamstring muscle flexibility in collegiate football players. After analysing the pre- and post-treatment data for dynamic soft tissue mobilization and foam roller exercise, this study demonstrated statistically that both activities significantly improved. When the groups were compared using both procedures, foam rolling turned out to be more effective.

In accordance with the inclusion and exclusion criteria, 44 individuals in total were recruited for the study following informed permission. They were split into two groups using a basic random sample procedure, with 22 people in each group. Following a thorough explanation of the whole process to the participants, pre-treatment tests were conducted, including an active knee extension test. Both methods are effective in treating patients, although the foam roller performs better than the dynamic soft tissue mobilization.

Dynamic STM is a systematic approach where the therapist moves the target region of tight muscles longitudinally under various muscular contraction conditions, focusing the therapy on that particular location. The hamstring muscle group is subjected to successive dynamic procedures in the dynamic STM component, which coordinate with the muscle's progression to the end range of motion. The last approach maximizes hamstring flexibility by eccentrically working the muscle at its functional length. Foam rollers are a technique that has become more and more popular in recent years as a way to dissolve fibrous adhesions in fascia, increase tissue length, and improve tissue flexibility. The impact of foam roller exercises on the Golgi tendon organ explains the physiology underlying the rise in active knee extension test. The location where skeletal muscle fibers penetrate into skeletal muscular tendon is where these proprioceptive sensory receptor organs are found. The Golgi tendon organ, which senses any change in muscle tension and reacts by releasing muscle spindles, is stimulated by the pressure applied by a foam roller. Consequently, this improves range of motion and promotes muscle fiber flexibility.

Additionally, the foam rolling technique mechanically creates friction between the foam roller and the deep and superficial layers of soft tissue, which activates mast cells and produces histamine. Vasodilation facilitates the faster and more thorough passage of waste materials from tissue to blood while also increasing blood flow to the treated region. Additionally, it is expected to raise blood flow and temperature within the muscle, which might improve the muscle's viscoelastic qualities.

Thus, better endothelial vascular function, decreased arterial stiffness, increased blood flow, decreased muscle tissue viscosity, and increased muscle temperature may all help to improve muscular flexibility.

Maghade S and Rao K, conducted a study on Dynamic soft tissue mobilization increases hamstring flexibility in healthy male subjects looked at how dynamic soft tissue mobilization (DSTM) affected the flexibility of the hamstrings in males. The results indicated that hamstring flexibility significantly increased right after DSTM administration. This implies that DSTM might be a beneficial strategy for improving flexibility in clinical or sports contexts.

Shruthi S K *et al*. **[5]** compared the effects of foam roller workouts and proprioceptive neuromuscular facilitation (PNF) on college students' hamstring flexibility. Both techniques considerably increased flexibility, according to the results, however PNF worked better than foam rolling.

According to the present study, foam roller is more effective than dynamic soft tissue mobilization, from a neurological perspective, foam rolling could more successfully activate mechanoreceptors that lower muscle tone and encourage relaxation than DSTM. Additionally, its ease of use promotes frequent use, which over time may result in increased flexibility. The better increase in hamstring flexibility seen with foam roller use is probably due to a combination of both mechanical and neurophysiological reasons. hence this study concludes Foam roller is more effective than dynamic soft tissue mobilization.

CONCLUSION

This study concludes that both Dynamic Soft Tissue Mobilization (DSTM) and Foam Rolling (FR) effectively improve hamstring flexibility. However, Foam Rolling demonstrated superior improvements in flexibility**.** Therefore, Foam Rolling can be considered a more effective intervention for increasing hamstring flexibility in college-level football players.

ACKNOWLEDGEMENT

I take this opportunity to express my sincere gratitude to those who contributed to the successful completion of this project. I am deeply indebted to my esteemed guide**,** Dr. Pooja Vora, for her expert guidance, consistent support, and valuable insights throughout the course of this work. I also extend my heartfelt thanks to Dr. Gaurav Patel, Principal, for his encouragement and the keen interest he demonstrated in the progress of this project.

REFERENCES

[1] Sharma S, Pearlson K, Nagaraj S. Impact of hamstring flexibility on functional performance of collegiate football players.

[2] Pawar N, Gupta P, Siddiqui S. Comparative study of dynamic soft tissue mobilization and passive stretching versus passive stretching alone on hamstring tightness of cricket players in order to increase rom.

[3] Nafees K, Baig AA, Ali SS, Ishaque F. Dynamic soft tissue mobilization versus proprioceptive neuromuscular facilitation in reducing hamstring muscle tightness in patients with knee osteoarthritis: a randomized control trial. BMC Musculoskeletal Disorders. 2023 Jun 2;24(1):447.

[4] Khan T, Rizvi MR, Sharma A, Ahmad F, Hasan S, Uddin S, Sidiq M, Ammari A, Iqbal A, Alghadir AH. Assessing muscle energy technique and foam roller self-myofascial release for low back pain management in two-wheeler riders. Scientific Reports. 2024 May 27;14(1):12144.

[5] Shruthi KS, Chintan S, Manal MA. Effectiveness of proprioceptive neuromuscular facilitation (PNF) vs foam roller exercise on hamstring muscle flexibility in college going students: A comparative study. Int J Yoga Physiother Phys Educ. 2022;7(1):7–15.

[6] Weerasekara I, Kumari I, Weerarathna N, Withanage C, Wanniarachchi C. The prevalence of hamstring tightness among the male athletes of university of peradeniya in 2010. J Palliative Care Med. 2013;1(108):2.

[7] Sakhalkar K, Nagulkar J, Mahajan P. Effectiveness of myofascial release versus passive stretching on hamstring flexibility in amateur football players-a comparative study. International Journal of Health Sciences and Research. 2022 Nov 8.

[8] Kothawale S, Rao K. Effectiveness of positional release technique versus active release technique on hamstrings

tightness. Int J Physiother Res. 2018;6(1):2619-2.

[9] Junker DH, Stöggl TL. The foam roll as a tool to improve hamstring flexibility. The Journal of Strength & Conditioning Research. 2015 Dec 1;29(12):3480-5.

[10] Maghade S, Rao K. Immediate effect of active release technique (ART) and dynamic soft tissue mobilization (DSTM) on hamstring tightness in young adults. MOJ Yoga Physical Ther. 2018;3(1):00039.