International Journal for Multidisciplinary Research (IJFMR)

E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Comparative Study of Myofascial Release versus Passive Stretching on Calf Flexibility in College-Level Amateur Football Players

Mr. Rohit Narsingrao Lawate[1], Dr. Ankita Dabshede[2]

[1]Intern, Physiotherapy Department, TMV's Indutai Tilak College of Physiotherapy
[2] Associate Professor, Physiotherapy Department, TMV's Indutai Tilak College of Physiotherapy

Abstract

Background: Calf muscle flexibility plays a crucial role in the performance and injury prevention of football players, as it directly affects their ability to accelerate, change direction, and maintain proper biomechanics during various movements on the field. Limited calf flexibility is associated with an increased risk of muscle strains, tendon injuries, and lower extremity joint problems among athletes.Traditional stretching methods, such as passive stretching have long been utilized to improve flexibility in athletes. However, emerging evidence suggests that myofascial release (MFR) techniques may offer additional benefits by targeting the fascial system, which surrounds and interconnects muscle fibers, promoting relaxation, and releasing tension within the muscle.

Method: A randomized controlled trial was conducted with 28 male amateur football players aged 18-25 years, who were randomly divided into two groups: the myofascial release group (n=14) and the passive stretching group (n=14). The myofascial release group underwent a specific myofascial release protocol targeting the gastrocnemius and soleus muscles, while the PS group participated in a traditional passive stretching routine. Both interventions were applied for 4 weeks, 3 sessions per week. Calf flexibility was assessed using the lunge test.

Result: Both groups showed significant improvements in calf flexibility post-intervention . However, the myofascial release group demonstrated a statistically significant greater improvement in both passive stretching and myofascial measurements compared to the passive stretching group. The effect sizes calculated indicated a large effect for the MFR group in both outcome measures.

Conclusion: The findings suggest that myofascial release is more effective than passive stretching in improving calf muscle flexibility in college-level amateur football players. These results highlight the potential benefits of incorporating MFR techniques into athletic training and rehabilitation programs to enhance flexibility, which could contribute to improved performance and reduced injury risk among football players.

Keywords: Myofascial Release, Passive Stretching, Football Players.

Introduction:

The calf muscle consists of two main muscles — the gastrocnemius and the soleus. Because these two muscles come together above your heel and attach to the Achilles tendon, some providers refer to the gastrocnemius and soleus as one large muscle with two sections. Gastrocnemius strains are common because the muscle connects to two joints (the knee joint and the ankle joint). The soleus connects to your tibia and fibula (the bones in your lower leg). Together with your gastrocnemius, the soleus helps you walk, run and jump. It also helps your legs support you so you can maintain good posture. You will notice large calf muscles on players that are crossing and shooting all the time. One of the best examples out there is Xherdan Shaqiri, his calves are one of the largest in world soccer, and yes, he has a pretty powerful strike as well. Myofascial release (MFR) is a widely employed manual therapy treatment that involves specifically guided low load, long duration mechanical forces to manipulate the myofascial complex, intended to restore optimal length, decrease pain, and improve function . MFR when used in conjunction with conventional treatment is said to be effective to provide immediate relief of pain and tissue tenderness It has been hypothesized that fascial restrictions in one region of the body cause undue stress in other regions of the body due to fascial continuity. This may result in stress on any structures that are enveloped, divided, or supported by fascia . The term fascia now includes the dura mater, the periosteum, perineurium, the fibrous capsular layer of vertebral discs, organ capsules as well as bronchial connective tissue and the mesentery of the abdomen Fascial tissues are seen as one interconnected. Myofascial practitioners claim that by restoring the length and health of restricted connective tissue, pressure can be relieved on pain sensitive structures such as nerves and blood vessels.[1]

MFR generally involves slow, sustained pressure (120e300 s) applied to restricted fascial layers either directly (direct MFR technique) or indirectly (indirect MFR technique). Direct MFR technique is thought to work directly over the restricted fascia: practitioners use knuckles or elbow or other tools to slowly sink into the fascia, and the pressure applied is a few kilograms of force to contact the restricted fascia, apply tension, or stretch the fascia. Indirect MFR involves a gentle stretch guided along the path of least resistance until free movement is achieved. The pressure applied is a few grams of force, and the hands tend to follow the direction of fascial restrictions, hold the stretch, and allow the fascia to loosen itself The rationale for these techniques can be traced to various studies that investigated plastic, viscoelastic, and piezoelectric properties of connective tissue . Recent Fascia Research Congresses (FRC) define fascia as a ‘soft tissue component of the connective tissue system that permeates the human body’. One could also describe them as fibrous collage-nous tissues that are part of a body-wide tensional force transmission system . The complete fascial net includes dense planar tissue sheets, ligaments, tendons, superficial fascia and even the innermost intra-muscular layer of the endomysium located tensional network that adapts its fibre a arrangement and density, according to local tensional demands Authors such as Day) and colleagues, have suggested that connective tissue could become tighter/denser in overuse syndromes, or after traumatic injuries, but it is unclear if this is due to an alteration of collagen fibre composition, of fibroblasts, or of ground substance. The same authors suggest that the alteration of fascial pliability could be a source of body misalignment, potentially leading to poor muscular biomechanics, altered structural alignment, and decreased strength and motor coordination. MFR practitioners claim to be clinically efficacious in providing immediate pain relief and to improve physiologic functions that have been altered by somatic dysfunctions. MFR directs force to fascial fibroblasts, as well as indirect strains applied to nerves, blood vessels, the lymphatic system, and muscles. Laboratory experiments suggest that fibroblasts, the primary cell type of the fascia, adapt specifically to mechanical loading in manners dependent upon the strain magnitude, duration and frequency. In their in-vitro modelling study demonstrated that treatment with MFR, after repetitive strain injury, resulted in normalization of apoptotic rate, and reduction in production of inflammatory cytokines. MFR is being used to treat patients with a wide variety of conditions, but there is little research to support its efficacy. According to Kidd the application of MFR is inherently not evidence-based medicine since it relies on clinician patient interaction; it cannot be a neutral treatment; therefore, the subjectivity of the interaction cannot be removed when we try to determine its outcome. Kidd indicated that much of the effect of MFR relies on the skill of the clinician and his or her ability to sense the changes in the tissue. In addition, biological effects of touch can change the effectiveness of the treatment, depending on the state of either the clinician or the patient. [3]

This variability means that interpreter reliability is low, and therefore, according to Kidd, prevents MFR from being considered evidence-based. Yet the same arguments have been applied to other manual therapies in the past that now are considered part of evidence-based practice. Although MFR is a popular therapy and anecdotal reports describe positive outcomes from MFR treatments, research is necessary to demonstrate its effectiveness to refute Kidd's argument. Therefore, the purpose of this systematic review was to critically analyse previously published literatures of RCTs to gather the documented effectiveness of MFR. Muscle stiffness of lower extremities and subsequent decrease of flexibility are generally considered etiological factors in musculoskeletal injuries.to prevent muscle injuries, stretching exercises before sports activity are usually recommended. Reasons for stretching relates to beliefs that stretching exercises will increase flexibility and decrease muscle stiffness. The intended purposes of stretching are 1) to ensure that the individual has sufficient range of motion. 2) To decrease muscle stiffness or increase muscle compliance thereby theoretically decreasing in With respect to performance improves performance and decreases injury The purpose of this study is to see Myofascial release technique is effective or Passive stretching in order to calf flexibility in amateur football players.[3,4]

Methods

Research design: This comparative study aimed to assess the effects of myofascial release versus stretching on calf flexibility among collegiate amateur football players. The study employed a comparative methodology, using the lunge test as the outcome measure to evaluate the interventions' efficacy.

Participants: The samples were selected according to the inclusion and exclusion criteria Samples were explained about the aim and objectives of the study The consent forms were filled by the participants and the study and procedure was explained to the participants The athletes fitting in the inclusion critria were evaluated by the outcome measures of special test which is Lunge test.**:-** Reliability and validity Inter-rater reliability was excellent for distance measure (ICC = 0.948), good for the inclinometer (ICC = 0.801) and moderate for the iPhone (ICC = 0.68)[2] Total 28 male amateur football players aged 18-25 years, who were randomly divided into two groups: the myofascial release group (n=14) and the passive stretching group (n=14).

Research tool: Lunge Test: A standardized assessment tool to measure calf flexibility by evaluating the distance between the rear knee and the heel during a lunge movement. Myofascial Release Technique: Utilizing hands skills to apply sustained pressure to the myofascial tissues, aiming to release tension and improve flexibility. Stretching Protocol: A prescribed series of calf stretches targeting the gastrocnemius and soleus muscles, typically held for a specific duration to improve muscle elasticity and range of motion. Randomized Controlled Trial Design, Pre- and Post-Intervention Assessment, Statistical Analysis, Participant Questionnaires

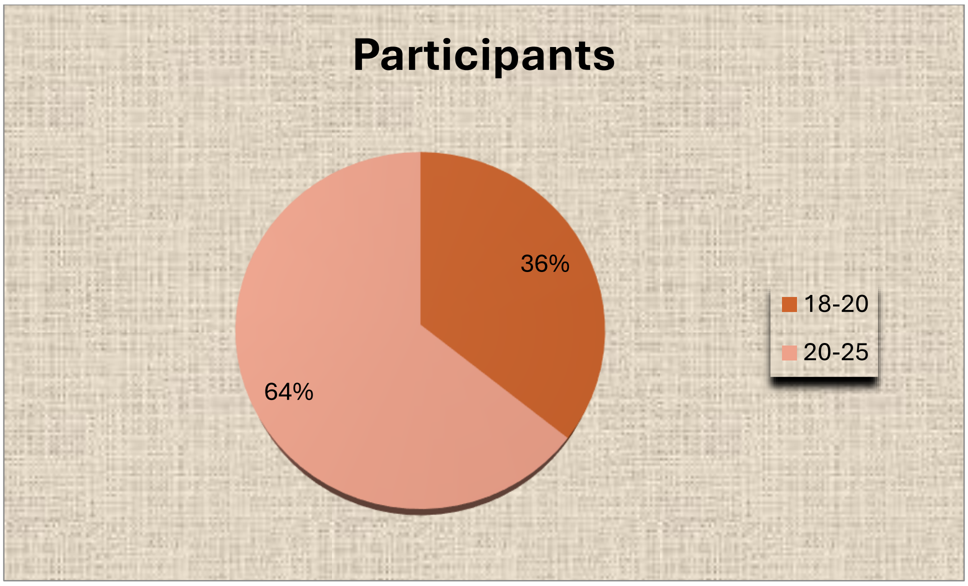
Ethics, consent and permissions: Participants in this study received a consent form which introduced the research project by including the title of the study, the aims of the study and reassuring the participants their information confidentiality as well as of their responses. Consent was given by each participant.

Data collection: The permission to perform and obtain data collection was taken from the ethical committe of college. Data collection took place between January 2024 and February 2024. The data collection sheet contained sections on personal as well as work demographics , with pre and post reading.

Data analysis: Improvement in the flexibility was analysed using lunge test. Data was entered in excel spread sheet, tabulated and subjected to statistical analysis. Data was analysed by using Graph pad Instant, checking effectiveness of Myofascial Release versus Passive Stretching on Calf Flexibility in College-Level Amateur Football Players

Table No 1. Age distribution

AGE	PARTICIPANTS
18-20	10
20-25	18

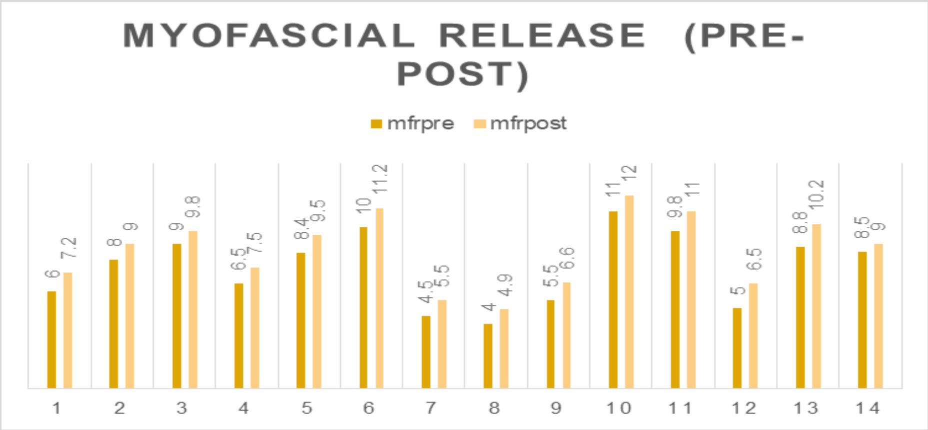


Graph No. 1 Age Distribution

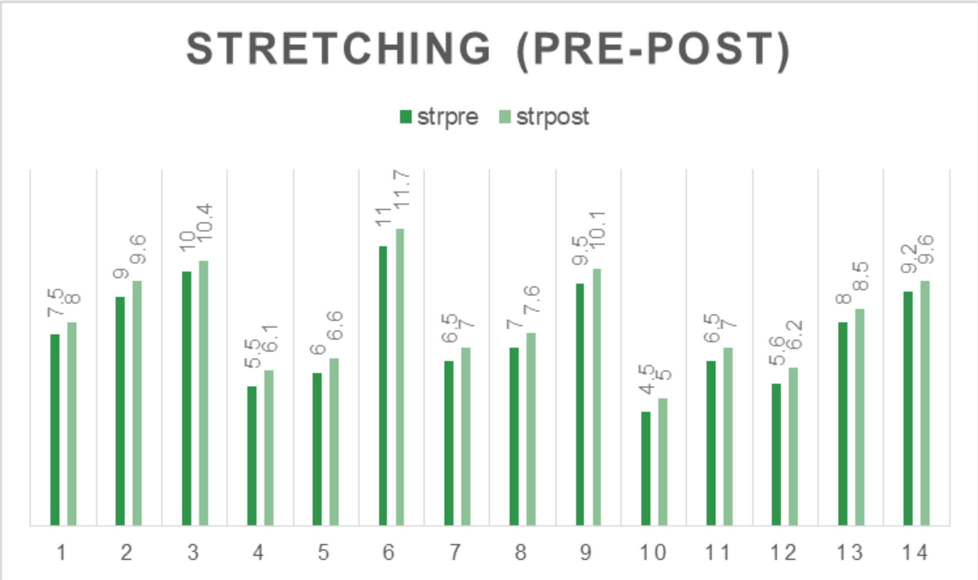
Interpretation: Graph 1 shows that out of 28 subjects 10 subjects were between 18-20 age group,18 subjects were between 20-25 age group

STATISTICAL ANALYSIS

Data analysis was done for Group A and Group B using outcome measure lunge test. The data passed normality test. Pre and post analysis for ranges by using Myofascial Release Technique for Group A was done by paired t test. Pre and post analysis for ranges by using Passive stretching technique for Group B was done by paired t test. Group A and Group B data was analysed using unpaired t test. Graph No. 2 Myofascial release (pre post)



Graph No. 2 Results for Myofascial Release

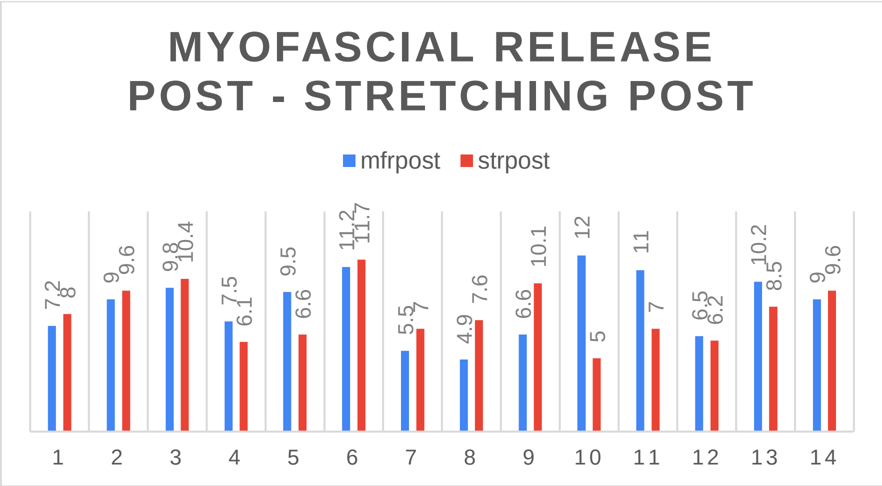


Graph No. 3 Results for Stretching (pre-post)

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Myofascial Release Post	8.5643	14	2.22005	.59333
	Myofascial Release Pre	7.5000	14	2.22814	.59550
Pair 2	Stretching Post	8.1000	14	1.94264	.51919
	Stretching Pre	7.5571	14	1.94054	.51863

Table No. 2 Paired Samples Statistics



Graph No. 4 Post comparison between myofascial versus Stretching

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Myofascial Release Post & Myofascial Release Pre	14	.994	.000
Pair 2	Stretching Post & Stretching Pre	14	.999	.000

Table No. 3 Paired Samples Correlations

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error	95% Confidence Lower	Upper			
Pair 1	Myofascial Release Post - Myofascial Release Pre	1.06429	.24685	.06597	.92176	1.20681	16.132	13	.000
Pair 2	Stretching Post - Stretching Pre	.54286	.08516	.02276	.49369	.59203	23.851	13	.000

Table No. 4 Paired Samples Test

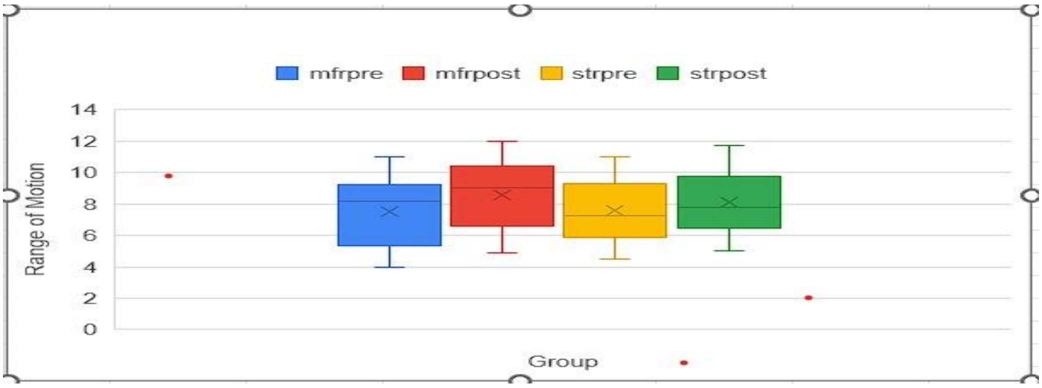
Inference: Myofascial Release: The p-value (Sig. (2-tailed)) for "Pair 1" is 0.000, which is less than the commonly used significance level of 0.05. This indicates a statistically significant difference between pre- and post-intervention flexibility scores in the Myofascial Release group. The positive mean difference (1.064) suggests an average improvement in flexibility after Myofascial Release.

Stretching: Similar to Myofascial Release, the p-value for "Pair 2" is also 0.000, indicating a statistically significant difference between pre- and post-intervention flexibility scores in the Stretching group. The positive mean difference (0.543) suggests an average improvement in flexibility after Stretching

Group Statistics

Group		N	Mean	Std. Deviation	Std. Error Mean
Range of Motion	mfrpost	14	8.5643	2.22005	.59333
	strpost	14	8.1000	1.94264	.51919

Table No. 5 Independent t test



Graph No. 5

Independent Samples Test

		Equality of		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Interval of the Lower	Interval of the Upper
Range of Motion	Equal variances assumed	.490	.490	.589	26	.561	.46429	.78842	-1.15633	2.08491
	Equal variances not assumed			.589	25.550	.561	.46429	.78842	-1.15772	2.08630

Table No. 6 Independent Samples Test

Results

Myofascial Release: The p-value (Sig. (2-tailed)) for "Pair 1" is 0.000, which is less than the commonly used significance level of 0.05. This indicates a statistically significant difference between pre- and post-intervention flexibility scores in the Myofascial Release group. The positive mean difference (1.064) suggests an average improvement in flexibility after Myofascial Release. Stretching: Similar to

Myofascial Release, the p-value for "Pair 2" is also 0.000, indicating a statistically significant difference between pre- and post-intervention flexibility scores in the Stretching group. The positive mean difference (0.543) suggests an average improvement in flexibility after Stretching Equal Variances Assumption: The Levene's test p-value (Sig.) is 0.490, which is greater than 0.05. Therefore, we can assume that the variances of the range of motion (ROM) scores in the Myofascial Release and Stretching groups are equal. This allows us to interpret the results based on the t-test assuming equal variances. Significance of Difference: The t-test p-value (Sig.) is 0.561, which is greater than 0.05. This indicates that there is no statistically significant difference in the mean ROM scores between the Myofascial Release and Stretching groups at the 5% significance level. Effect Size: While not statistically significant, the table shows a positive mean difference of 0.464 units, suggesting that the Myofascial Release group might have a slightly higher average ROM improvement compared to the Stretching group. However, due to the non-significant p-value, we cannot definitively claim this based on this data alone.

DISCUSSION

Flexibility stands out as the primary element in any training regimen. It refers to a muscle's capacity to lengthen, enabling joints to move through a range of motion. Optimal ankle flexibility correlates with better dynamic balance, which is crucial for various aspects of soccer performance such as ball control, kicking accuracy, and agility. Consequently, enhancing calf muscle flexibility through techniques like myofascial release (MFR) or passive stretching holds promise for improving soccer performance. Our research compared the effectiveness of MFR and passive stretching in enhancing calf muscle flexibility among amateur football players. The permission to perform and obtain data collection was taken from the ethical team of college.The samples were selected according to the inclusion and exclusion criteria.They were explained about the aim and objectives of the study.The consent forms were filled by the subjects and the study and procedure was explained to the players.The athletes fitting in the inclusion critria were evaluated by the outcome measures of special test which is -Lunge test

In our study the players were divided into 2 groups; Group A and Group B ;one group were given myofascial release and other group were given passive stretching total 28 sample size were taken into which 10 subjects were between 18-20 age group and remaining 18 subject were between 21-25 lunge test was taken as outcome measure a pre assessment was taken then both groups where asked to play the football after completion of football practice Myofascial release to one group and passive Stretching was given 3-4 times a week after completion of 4 weeks again the lunge tesr was perform to asses the change in flexibility in both groups .Data was entered in excel spreadsheet,tabulated and subjected to statistical analysis. Data was analysed by using graph pad Instat Equal Variances Assumption: The Levene's test p-value (Sig.) is 0.490, which is greater than 0.05. Therefore, we can assume that the variances of the range of motion (ROM) scores in the Myofascial Release and Stretching groups are equal. This allows us to interpret the results based on the t-test assuming equal variances.Significance of Difference: The t-test p-value (Sig.) is 0.561, which is greater than 0.05. This indicates that there is no statistically significant difference in the mean ROM scores between the Myofascial Release and Stretching groups at the 5% significance level.

Effect Size: While not statistically significant, the table shows a positive mean difference of 0.464 units, suggesting that the Myofascial Release group have a slightly higher average ROM improvement compared to the Stretching group. However, due to the non-significant p-value, we cannot definitively claim this based on this data alone.The findings revealed a notable increase in lunge test angle post-treatment, with MFR showing superior results compared to passive stretching. Thus, integrating MFR into training routines can help maintain physical function and performance during periods of restricted activity, potentially by influencing the elastocollagenous complex and ground substance. Increased soft-tissue flexibility reduces tension within the elastocollagenous complex, while alterations in the matrix's density and viscosity enhance metabolic activity, ultimately contributing to improved performance [4]for hamstrings highlighted its positive impact not only on flexibility but also on overall physical Similarly, Keisuke Itotani et al.'s study on MFR performance.

Enhanced metabolic function and overall health are outcomes associated with improved flexibility. When fascia becomes shortened, tightened, or twisted, it can contribute to and sustain musculoskeletal issues. However, our study demonstrated that applying myofascial release (MFR) led to an increase of -- centimetres in the lunge test, while passive stretching resulted in an increase of -- centimetres. This discrepancy may be attributed to the mechanism by which MFR prompts the Golgi tendon organ to detect changes in muscle tension and subsequently induce muscle spindle relaxation. Winter et al. noted that passive stretching involves externally applying stretching force to muscles, while active stretching relies on reciprocal innervation to relax antagonist muscles. In a previous study by Yuichi Nishikawa et al. on the immediate effects of passive and active stretching on hamstring flexibility, it was observed that holding the final knee extension position for 10 seconds led to excitatory spinal motor neurons overcoming γ inhibitory neuron impulses. Passive stretching has shown effectiveness in improving flexibility, particularly in patients with contractures or limited range of motion.[5]

Physiological effects of both Stretching and Myofascial Release:-

Muscle Lengthening: Regular calf stretching promotes the lengthening of the calf muscles, including the gastrocnemius and soleus, which can become tight due to the repetitive nature of football movements like running, jumping, and kicking.

Improved Flexibility: Stretching enhances flexibility by increasing the range of motion in the ankle joint, allowing football players to achieve greater stride length during running and agility movements, which can improve performance and reduce the risk of injury.

Enhanced Blood Circulation: Stretching increases blood flow to the calf muscles, promoting nutrient delivery and waste removal, which can aid in muscle recovery and reduce soreness after intense training or matches.

Injury Prevention: Flexible calf muscles are less prone to strains, tears, and other injuries common in football, such as Achilles tendonitis and calf muscle strains. By maintaining optimal muscle length and flexibility, football players can minimize the risk of acute and overuse injuries. Optimized Muscle Activation: Proper stretching techniques can help activate the calf muscles effectively, improving their readiness for dynamic movements required in football, such as sprinting, jumping, and rapid changes of direction.(5,10)

Myofascial release enhances tissue flexibility by addressing damage or scarring in the fascia caused by trauma, overuse, inflammation, or immobility. This therapy stimulates neural receptors within muscles, elevating fascial temperature and altering fiber length through applied pressure. Enhanced tissue elasticity fosters greater movement within the fascia, preventing restrictions and adhesions. Moreover, myofascial release boosts blood circulation, facilitating nutrient delivery and waste removal, thus mitigating adhesions and promoting proper fascial function.The advantages of myofascial release include. Pain reduction,Decreased fascial tension, Expanded range of motion

This therapy alleviates myofascial pain originating from trigger points, which are hypersensitive areas within soft tissues. By releasing trigger points and improving circulation, myofascial release diminishes discomfort and enhances flexibility. Additionally, it mitigates tension within the fascia, alleviating tightness and discomfort caused by restrictive barriers. By breaking down adhesions and easing muscle tension, myofascial release aids in restoring joint mobility and blood flow following injury, facilitating movement recovery[12].

Myofascial Release: MFR can be beneficial for football players by addressing specific areas of tightness or restriction, such as the calf muscles. It may aid in recovery after intense training sessions or matches, reduce the risk of injury, and improve overall muscle function and performance.Passive Stretching: Passive stretching is widely used in athletic training programs to enhance flexibility, which is essential for football players to perform dynamic movements like sprinting, jumping, and changing direction effectively. By increasing calf flexibility, passive stretching can help improve running mechanics, reduce the risk of muscle imbalances, and optimize athletic performance. Considerations and Recommendations:Individual Needs: The effectiveness of MFR vs. passive stretching may vary depending on individual factors such as muscle tightness, training history, and injury status. Some athletes may benefit more from one approach over the other based on their specific needs and goals.

Combination Approach: Incorporating both MFR and passive stretching into a comprehensive training program may offer synergistic benefits. For example, using MFR techniques to address specific areas of tightness followed by passive stretching to further elongate the muscles can provide a well-rounded approach to improving flexibility and reducing injury risk.Consistency and Progression: Regardless of the chosen approach, consistency and progression are key. Football players should incorporate regular MFR or passive stretching sessions into their training routine and gradually increase intensity or duration over time to continue seeing improvements in flexibility and performance.In conclusion, both myofascial release and passive stretching can be valuable tools for amateur football players seeking to optimize calf flexibility, improve performance, and reduce the risk of injury. Understanding the mechanisms, effects, and potential benefits of each approach can help athletes make informed decisions when designing their training programs[8,9,10].

Limitations

A study comparing myofascial release and stretching on calf flexibility in college-level amateur football players could yield valuable insights. However, some potential limitations to consider include:

- Sample Size and Diversity
- Measurement Tools
- Blinding
- Ethical Considerations

Addressing these limitations through careful study design, participant recruitment, rigorous measurement techniques, and ethical considerations will enhance the validity and reliability of the study.

Conclusion

Based on the analysed data, the conclusion drawn was that the myofascial release technique yielded superior results compared to passive stretching in enhancing calf flexibility among college-level amateur football players.

Acknowledgement:
We would like to thank the students who participated in the study.

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