

# Effect of Muscle Energy Technique Versus Active Release Technique on Hip Flexibility, Arm Muscular Power and Lob Shot Proficiency in Badminton Players- A Research Protocol

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Publication Date: 2025/06/20

## Abstract:

### ➤ Title:

Effect of Muscle Energy Technique Versus Active Release Technique on Hip Flexibility, Arm Muscular Power, and Lob Shot Proficiency in Badminton Players

### ➤ Background:

Badminton demands high levels of flexibility, strength, and technical skill. Muscle tightness, especially in the hip and upper body, often hinders athletic performance. Muscle Energy Technique (MET) and Active Release Technique (ART) are commonly used to improve muscle flexibility and strength, but limited evidence compares their efficacy in badminton performance.

### ➤ Objective:

To compare the effectiveness of MET and ART on hip flexibility, arm muscular power, and lob shot proficiency in recreational badminton players.

### ➤ Methodology:

A comparative study involving 40 participants aged 18–30 years was conducted at Dr. D. Y. Patil College of Physiotherapy. Participants were randomly divided into two groups: Group A received MET with conventional physiotherapy, and Group B received ART with conventional physiotherapy. Interventions were administered over two weeks. Outcome measures included the Sit and Reach Test, Popliteal Angle Test, and Seated Single Arm Shot Put Test.

### ➤ Expected Outcomes:

Both MET and ART are anticipated to enhance hip flexibility and arm power. This study aims to identify which technique produces more significant improvements, thereby contributing to optimal treatment strategies for badminton players.

### ➤ Conclusion:

The study will provide evidence on the comparative effectiveness of MET and ART, guiding physiotherapists and coaches in enhancing performance and preventing injuries in badminton athletes.

**How to Cite:** Dr. Komal Agrawal; Aditya Rathod; Dr. Rutwa Pandya; Dr. Pallavi Chopade; Dr. Pallavi Manathkar; Dr. Sana Ahmad (2025) Effect of Muscle Energy Technique Versus Active Release Technique on Hip Flexibility, Arm Muscular Power and Lob Shot Proficiency in Badminton Players- A Research Protocol. *International Journal of Innovative Science and Research Technology*, 10(6), 1218-1223. <https://doi.org/10.38124/ijisrt/25jun609>

## I. INTRODUCTION

Badminton is a sport widely played all over the world.

It is played as a casual outdoor activity in yard or on a beach, professionally the game is played on a rectangular indoor court. Badminton is one of the most popular sports in the

world, with an estimated 220 million spectators worldwide. Despite being seen as a non-contact sport, badminton is surprisingly prone to injuries. Although some studies show injury rates as high as seven injuries per 1000 hours, the average injury frequency is between one and four injuries per 1000 hours. Even among elite players, there is a wide range of injury incidence estimates published in earlier research. Methodological heterogeneity and variations in performance levels, research quality, sex, and age groups further complicate the epidemiological uncertainty in badminton.<sup>(1)</sup>

The ability to move in all directions and change directions fast, fluidly, and effectively is essential for badminton players. In addition to wearing down the body, sudden starts and stops require a lot of strength and motor abilities for acceleration, deceleration, and then rapid acceleration. At the same moment, the athlete must manage their ankles, knees, hips, back, and shoulders. Additionally susceptible to overuse injuries are the shoulder's structural components, especially the tendons. Younger badminton players also have foot, shin, hip, and knee pain and injury. In this sport, Achilles tendon ruptures are also somewhat prevalent, particularly in senior athletes.<sup>(2)</sup>

Fred Mitchell came up with a method known as the Muscle Energy Technique (MET) in 1948. This type of manual therapy, which is popular in osteopathy, lengthens muscles by using their own energy in the form of mild isometric contractions to relax them through autogenic or reciprocal inhibition. MET is an active approach where the patient actively participates, in contrast to static stretching, which is a passive technique where the therapist does all the work. The principles of MET are autogenic inhibition and reciprocal inhibition. If a sub-maximal contraction of the muscle is followed by stretching of the same muscle it is known as Autogenic Inhibition MET, and if a submaximal contraction of a muscle is followed by stretching of the opposite muscle, then this is known as Reciprocal Inhibition MET.<sup>(3)</sup>

Muscle Energy Techniques can be applied to any condition where the objective is to increase joint range of motion (ROM) and induce muscle relaxation and lengthening. Almost any joint in the body can benefit from the safe application of muscle energy techniques. In order to protect themselves from potential joint and muscle injuries, many sportsmen employ MET. It is mostly used to treat chronic muscle pain, stiffness, or injury; people with limited range of motion (ROM) due to facet joint dysfunction in the neck and back; and people with broader conditions such as shoulder discomfort, scoliosis, sciatica, asymmetrical legs, hips, or arms.<sup>(4)</sup>

A soft tissue technique called Active Release Techniques (ART) aims to release tissue tension by removing adhesions and fibrosis that can form in tissues as a result of overload from repeated use. Muscle weakness, numbness, aching, tingling, and burning sensations can result from these conditions. Though there is little scientific data about how ART affects different illnesses, it has been reported to be both a diagnostic and a therapy tool. Trauma can cause detrimental

alterations in tissues, including adhesions, fibrosis, and edema. In order to treat repetitive strain injuries, cumulative trauma injuries, and persistent pressure tension lesions, the therapist applies compressive, tensile, and shear pressures using manual therapy. The patient is encouraged to actively shift the injury site from a shorter to a lengthened position as the therapist applies deep tension to the sore spot. Putting a contact point close to the lesion and having the patient move such that soft tissues, such as muscles, ligaments, and nerves, slide longitudinally beneath the contact point.<sup>(5)</sup>

A combination of flexibility, muscular strength, and technical skill are necessary for success in badminton, a very demanding sport. Hip flexibility is one of the most important physical characteristics for a player's ability to move fast and effectively, and arm muscle power is necessary for producing powerful shots like lobs and smashes. An essential part of a player's skill set is a well-executed lob shot, which calls on arm strength to reach distance and accuracy as well as hip flexibility to properly position the body.<sup>(6)</sup>

Muscle tightness and flexibility issues, however, are common among athletes and can impair performance. Specifically, the hip area frequently has limited range of motion, which impairs mobility and alters how some shots are executed. Additionally, strain in the upper body or muscular imbalances can impair arm power, which is crucial for making dynamic badminton shots.<sup>(7)</sup>

## II. NEED OF STUDY

Badminton is a fast-paced sport that requires a blend of strength, speed, and flexibility. To succeed in the game, sportsmen need to possess specific physical qualities including hip flexibility and arm muscle power in order to execute essential motions like lunges, smashes, and lob shots. Arm power is closely related to the speed, precision, and control of shots, particularly the lob shot, while hip flexibility in particular is crucial for enabling players to make quick and efficient movements. As a result, enhancing these physical attributes may directly affect a player's on-court efficacy and performance.

Active Release Technique (ART) and Muscle Energy Technique (MET) are two popular therapy approaches intended to increase muscle strength and flexibility. MET helps to restore movement patterns and increase range of motion by stretching and lengthening muscles using the body's natural muscular contractions. By applying precise pressure to the afflicted areas, ART, a manual treatment, improves circulation and muscle function by addressing soft tissue adhesions and muscular stiffness. Although it has been demonstrated that both methods increase muscular strength and flexibility, few research have examined how they affect the physical demands of badminton, particularly with regard to hip flexibility, arm power, and shot competence.

The importance of these physical characteristics in badminton play makes comparison research of the two methods MET or ART to determine which one offers more significant gains in muscular power, flexibility, and technical

competence imperative. In the end, performance may be maximized and injury risk decreased by coaches, physical therapists, and athletes themselves making better judgments about training and rehabilitation plans when they understand how each approach impacts important performance factors.

### III. AIM AND OBJECTIVES

#### ➤ Aim

To study the effectiveness of Muscle energy technique versus Active release technique on hip flexibility, arm muscular power and lob shot proficiency in badminton players.

#### ➤ Objectives

- To find out the effect of Muscle energy technique on hip flexibility, arm muscular power and lob shot proficiency in badminton players.
- To determine the effect of Active release technique on hip flexibility, arm muscular power and lob shot proficiency in badminton players.
- To compare the effect of Muscle energy technique versus Active release technique on hip flexibility, arm muscular power and lob shot proficiency in badminton players.

### IV. MATERIAL AND METHODOLOGY

#### ➤ Study Design: Comparative study

#### ➤ Study Setting: Dr. D. Y. Patil college of physiotherapy

#### ➤ Sampling Method: Convenient Sampling

#### ➤ Sample Size: 40, calculated using Winpepi Software Version 11.65 with Difference 8.8

#### ➤ Sample Population: Recreational Badminton Players

#### ➤ Material Required

- Goniometer.
- Yoga mat.
- Pen.
- Diary.
- Shot put
- Sit and reach instrument
- Measuring Tap
- Consent form.

#### ➤ Inclusion Criteria:

- Participants with age between 18-30 years
- Participants having reduced hip flexibility and arm muscle power professional as well as recreational badminton players
- Willingness to participate and provide informed consent

#### ➤ Exclusion Criteria:

- Participants having recent lower limb injuries
- Participants with surgical history involving lower limb
- Participants with any neurological disorders that affect movement or sensation
- Individuals with conditions that contraindicate the use of Muscle energy technique and Active release technique.

#### ➤ Outcome Measures

##### • Sit and Reach Test-

The Sit and Reach Test is a common flexibility test used to measure the flexibility of your lower back and hamstrings. Here's how it's typically done.

##### ✓ Procedure:

**Sit on the Floor:** Sit on the floor with your legs stretched straight in front of you, keeping your feet about 12 inches apart.

##### ✓ Feet Position:

Your feet should be flexed (toes pointing up), and the soles of your feet should face forward. Your knees should be kept straight.

##### ✓ Starting Position:

Place a measuring device (usually a sit-and-reach box or a ruler) in front of you, aligned with your feet. Sit up straight with your arms extended in front of you.

##### ✓ Reach Forward:

Slowly lean forward, keeping your knees straight, and try to reach as far as you can toward your toes (or beyond) with both hands. Make sure to bend at your waist, not at your back, and keep your arms extended.

##### ✓ Measurement:

The furthest point you can reach is noted. In some versions, you may hold the position for a few seconds, while others take the reading at the moment you stop.

##### ✓ Record Results:

Typically, results are measured in centimetres or inches. The best of three trials is usually taken as the final score.

##### • Scoring:

- ✓ A score that's greater than zero means you've reached past your toes.
- ✓ A score of zero indicates you've reached exactly to your toes.
- ✓ A negative score means you weren't able to reach your toes.

#### ➤ Reliability and Validity: -

ICC Value-0.90

##### • Seated Single Arm Shot Put Test: -

Test designed to assess upper body strength, particularly in the shoulder, arm, and trunk, which is essential

for badminton players who require strong overhead and lateral arm movements. Here's how the procedure works.

➤ *Procedure:*

• *Set-Up:*

- ✓ Sit on the floor with your back straight against a wall or sturdy support. Your legs should be bent at a 90-degree angle, with feet flat on the floor and knees pointing forward.
- ✓ Keep your torso stable and your core engaged to prevent any movement during the test. The objective is to focus on the strength of your upper body while minimizing the use of your legs.

• *Positioning the Shot Put:*

- ✓ Hold the 2.72 kg shot put in one hand. The shot put should rest near your shoulder, with the elbow bent at a 90-degree angle. The shot put should be placed close to your neck or cheek (similar to the standard position for a shot-put throw).
- ✓ Your other hand should rest on your lap or be placed in a relaxed position.

• *Execution:*

- ✓ From a seated position, use your single arm to push the shot put away from your body in a smooth, controlled, and explosive motion. Aim to generate as much power as possible using your shoulder, arm, and torso.
- ✓ The motion should be similar to a shot-put throw, but you remain seated, so you must rely on your upper body strength and torso rotation to generate force.
- ✓ Make sure to keep your knees bent and feet flat on the floor during the motion, as your legs should not contribute to the throw.

• *Measurement:*

- ✓ After the shot put is released, measure the distance it travels along the floor. The distance is measured from the starting position (where you were sitting) to the point where the shot-put lands.
- ✓ The shot put should ideally travel in a straight line. Ensure that the floor is smooth and free of obstructions to get an accurate measurement.

• *Record Results:*

- ✓ Perform the test two or three times and record the best distance of the shot put thrown.
- ✓ This distance will be your final score for the Seated Single Arm Shot Put Test.

• *Instrument Used:*

- ✓ Shot Put: A 2.72 kg weight, typically used for this test with badminton players. This weight is lighter than standard shot-put weights to account for the differences in

the sport's requirements.

- ✓ *Measuring Tape:* To measure the distance the shot-put travels along the floor.

➤ *Reliability and Validity:* -

ICC Value- 0.97

• *Popliteal Angle Test-*

The popliteal angle test measures the angle between the thigh and calf to assess hamstring tightness. It is Performed during physical examinations to evaluate range of motion and muscle length in the hamstrings, which can be useful when assessing conditions such as hamstring tightness or strain.

• *Patient Position:*

The patient should be lying in a supine position (on their back) with both legs extended. The examiner should be at the patient's side, ready to move the leg

• *Procedure:*

The therapist flexes the patient's hip to approximately 90 degrees while keeping the knee fully extended. With the hip flexed, the examiner gently extends the knee while keeping the hip in the 90-degree position. The point at which the knee begins to flex (i.e., where further knee extension is no longer possible without discomfort or pain) is noted.

• *Measurement:*

The popliteal angle (angle between the femur and tibia) is used to quantify flexibility and tightness. A smaller angle indicates tight hamstrings, while a larger angle suggests more flexibility.

• *Interpretation:*

Normal Range: A popliteal angle greater than 20-30 degrees is typically considered normal, meaning the hamstrings have adequate flexibility.

• *Limited Flexibility:*

If the angle is smaller (less than 20-30 degrees), it indicates tightness in the hamstrings or potential shortened muscle length.

➤ *Reliability and Validity:* -

ICC Value:Single measure – U/L RT-0.80

LT-0.86

B/L- 95%

## V. PROCEDURE

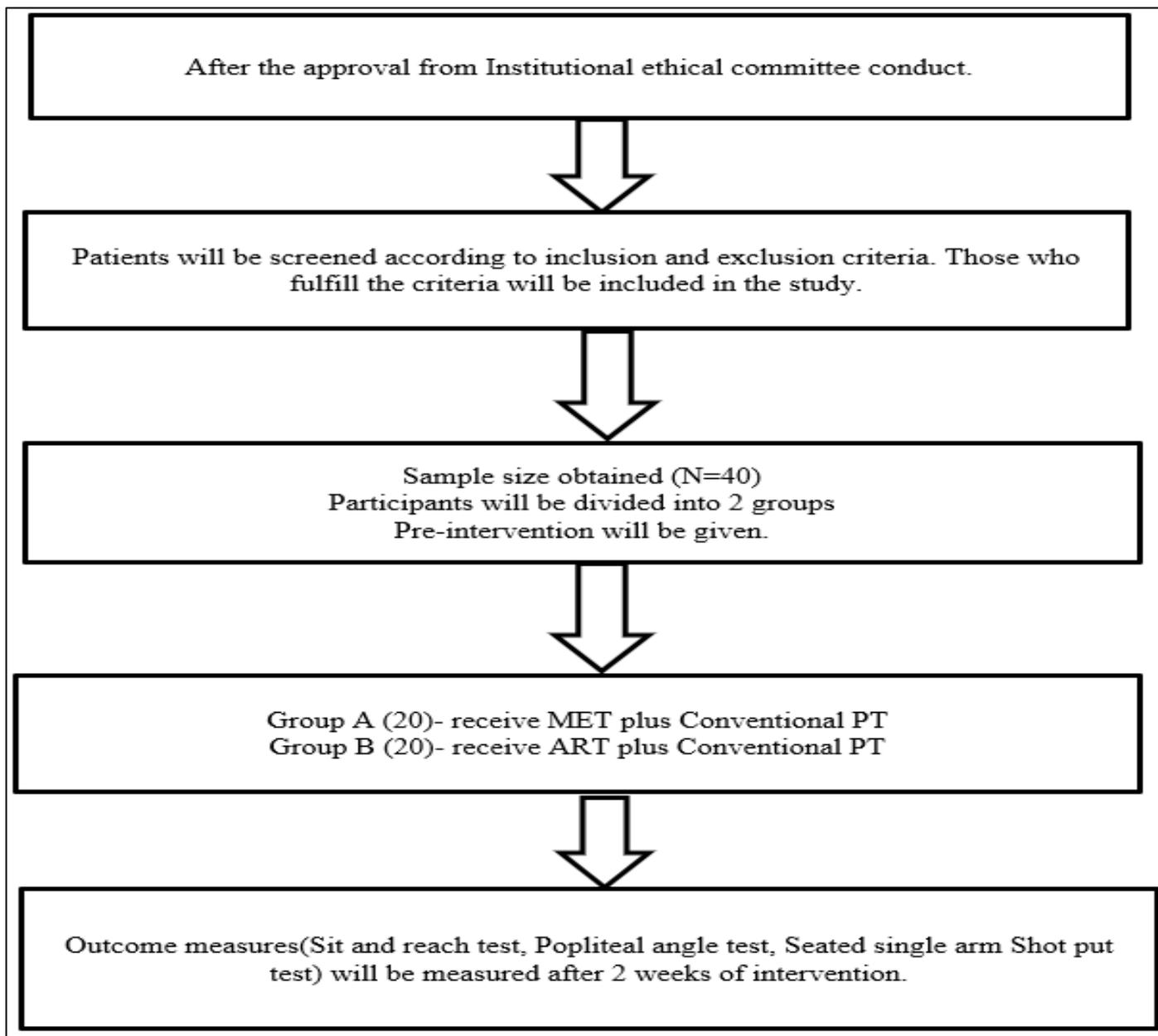


Fig 1 Procedure

### Group A

#### ➤ Muscle Energy Technique:

##### • For Hip Flexibility

In Group A, participants PIR in a supine position, where a passive stretch will be applied to the hamstring before performing isometric contractions three times. After PIR, they will be performing three exercises: -

**Stiff-Legged Dead lift:** The participant stood with knees locked, bent forward while maintaining a neutral back and extended knees. (3 reps)

**Eccentric Hamstring Curls on Swiss Ball:** In supine position, feet on the Swiss ball, the subject flexed knees to

roll the ball toward their buttocks, and then straightened them back to the start. (3 reps)

**Wrist Plank to Downward Dog on Swiss Ball:** From a wrist plank on a bench with feet on the Swiss ball, the subject moved to a downward dog position while keeping knees extended. (3 reps)

#### ➤ Arm Muscular Power:

##### • Procedure:

- ✓ Positioning: The patient is positioned to target the muscle or joint in need of treatment (e.g., the arm or shoulder).
- ✓ Isometric Contraction: The therapist applies a counterforce while the patient contracts the target muscle

isometrically (without changing the length of the muscle) for 5-10 seconds.

- ✓ Relaxation and Stretching: After the contraction, the patient relaxes, and the therapist gently stretches the muscle to its new, greater length.
- ✓ Repetition: This cycle (contract-relax-stretch) is repeated 3-5 times, progressively increasing the range of motion.
- ✓ Effect on Arm Power: By improving flexibility and muscle length, MET helps reduce muscle tightness, allowing for more efficient and forceful muscle contractions, thus enhancing arm power.

## Group B

### ➤ Active Release Technique:

#### • For Hip Flexibility

In **Group B**, after pre-intervention testing, participants will receive ART in a side-lying position with the affected leg on top in a shortened HMC position (hip extension, knee flexion).

The therapist will apply deep pressure to knots and adhesions while the subject performed hip flexion and knee extension to lengthen the HMC, repeated three times.

The same exercises as Group A will be performed, and outcome measures will be assessed post-intervention.

### ➤ Arm Muscular Power:

#### • Procedure:

- ✓ Identifying the Tight Area: The therapist locates areas of muscle tightness, adhesions, or scar tissue (commonly around the shoulders, forearms, or upper arms).
- ✓ Pressure Application: The therapist applies deep, focused pressure on the affected muscle or soft tissue.
- ✓ Active Movement: While maintaining the pressure, the patient actively moves the arm through a specific range of motion, which helps release muscle adhesions and restore proper tissue mobility.
- ✓ Repetition: This process is repeated in different positions or muscle groups until the therapist feels the muscle has released and regained proper movement.
- ✓ Effect on Arm Power: ART directly targets muscle adhesions and tightness, which can hinder muscle function. By breaking down these restrictions, ART improves muscle efficiency, range of motion, and ultimately arm power.

## VI. CONCLUSION

This study protocol outlines a comparative analysis of Muscle Energy Technique (MET) and Active Release Technique (ART) in improving hip flexibility, arm muscular power, and lob shot proficiency among recreational badminton players. By utilizing reliable outcome measures and controlled intervention protocols, the study aims to provide insight into which technique offers superior benefits for key physical attributes in badminton performance. The

findings are expected to guide physiotherapists, coaches, and athletes in selecting evidence-based techniques for optimizing performance and reducing injury risk. Ultimately, this research will contribute to advancing therapeutic approaches in sports physiotherapy specific to racquet sports like badminton.

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