ORIGINAL ARTICLE

IJPHY

# Muscle Energy Technique, Stretching and Strengthening on Hip Rotation Range and Kick Distance in Football Players with Adductor Related Groin Pain

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## ABSTRACT

***Background:*** Football is a commonly played team sport, and kicking is the primary skill needed. The incidence of adductor strain is high in football players, and thus their kick distance is affected due to groin pain. This indicates the importance of stretching and strengthening exercises as a necessary therapeutic technique to treat these sportspeople.

***Objective:*** To compare the effectiveness of muscle energy techniques (MET), stretching and strengthening exercises on hip rotation, and kick distance.

***Design:*** Randomized Control Trial.

***Methods:*** Forty football players suffering from groin pain due to adductor strain were selected from five professional soccer clubs in Jazan, Saudi Arabia, and randomized into two equal groups. Affected hip joint rotation [Internal + External Rotation] range, instep kick, and sidekick distances were measured and documented as baseline values. In addition, group A received MET, stretching, and strengthening exercises, whereas group B received only stretching and strengthening exercises for six weeks. Post-test values of the outcome measures were recorded at the end of the intervention.

***Results:*** Statistical comparison of the results between the groups showed that the MET group had significant improvement than the strengthening and stretching group in the hip rotation range ($p<0.005$), but the difference was not significant for both in-step kick and front kick distance ($p<0.0001$).

***Conclusion:*** Thus, adding MET to the routine strengthening and stretching exercise regimen can be clinically beneficial in treating groin pain among football players.

***Keywords:*** Muscle energy technique, kick distance, hip rotation, adductor strain, groin pain.

Received 07th May 2021, accepted 23rd August 2021, published 09th September 2021

10.15621/ijphy/2021/v8i3/1050

www.ijphy.org

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## INTRODUCTION

Football is one of the most played games in the world [1]. Injuries of the lower extremity are widespread in football as it involves many activities such as kicking, running, jumping, cutting, and stepping [2]. The most common injuries among the strains around the hip joint, rectus femoris, hip adductors, and rectus abdominis [3]. Hip adductor muscle strain is less common in football players than in hockey; adductor longus muscles are usually strained. The leading cause of groin pain in football players is the strain of the three adductor muscles, namely adductor longus, adductor brevis, and adductor magnus [4]. The prevalence of groin pain in athletes and football players is about 10% to 18% in football players [5-7]. Etiology for this groin pain can be many factors, and about 27% of the players reported more than one cause for it [8]. Anatomical reviews identified that the arrangement and pattern in which adductor muscle fibers unites, its variation of blood supply to the proximal tendon and their fibro-cartilaginous entheses are the reasons for adductor-related groin pain [9].

Adductor muscle tightness [10-11], previous adductor injury [4], and imbalance between hip adductor and abductor groups of muscles [4] are identified as the risk factors for adductor strains in players. In addition, types of sports, high level of sports, players' age, fitness, and core stability are also the potential risk factors in adductor strain [12-14]. Adductor strain occurs in sports activities despite risk factor analysis and execution of the injury prevention program [15-16]. An unexpected change in the direction [17] and forceful external rotation with the abduction of the hip joint [17] are the most common incidence of adductor injury. On physical examination, clinicians can quickly diagnose the muscle strain by evaluating the tenderness on palpation and pain on resisted isometrics of adductor muscles [18]. Management of the muscle strain in the acute stage includes rest, ice, compression, and elevation to reduce the pain and swelling; later, muscle stretching, strengthening, joint mobilization, and soft tissue techniques can be added to regain function and fitness [19]. Biomechanically, muscle strength and/or flexibility are found to strongly influence musculoskeletal injuries in different types of sports persons [1,6,20]. Soft tissue technique helps in restoring the muscle's length and strengthening the exercise program of the injured muscle returns the players to sports activity at the earliest.

Muscle energy technique (MET) is used to treat the muscle strains by encouraging the voluntary contraction of injured muscles in a precisely controlled direction against a counterforce. In addition, MET is used to attain tonus release by muscle inhibition. In this technique, isometric contraction of the injured muscle is produced after isometric relaxation with the influence of the Golgi tendon [21]. The therapeutic effect of MET includes pain reduction, stretching of the tight muscle and fascia, reduction of muscle tone, increase in circulation locally, mobilization of the stiff joints, and strengthening of the weak muscles [22].

This study compares the effect of muscle energy technique with adductor stretching and strengthening program in football players with groin pain.

## METHODOLOGY

Ethical approval for this study on human subjects was obtained from the Research and Ethics Committee, Department of Physical Therapy, Jazan University [No. IEC/87/R&D/08/JU-PT (13/2020)]. After explaining the benefits, outcome, and scope of the research, written informed consent from all the players was obtained before inclusion in the study. Subjects were allowed to leave the study at any point in time.

Subjects with a history of groin or adductor strain were included. Other inclusion criteria were male players, groin pain during or after the game, groin pain > 8 weeks, tenderness on palpation, pain during hip adduction with resistance, and willingness to participate in the research. Subjects excluded subjects with urinary tract infection, lower limb fractures, metastasis, spinal pathology, hip joint osteoarthritis, and inguinal pain. Anthropometric data, including age, height, and weight, were recorded. In addition, their marital status, occupation, smoking habits, dominant leg, duration of playing football in a week, including the training sessions and previous interventions if any were noted. Forty subjects were included from five professional football clubs, and an experienced musculoskeletal physiotherapist assessed their groin pain with resistance and tenderness on palpation.

**Intervention:**

***Group - A [Experimental Group]:***

Patients in this group received Muscle Energy Technique [MET], stretching and strengthening their hip adductor muscle. The protocol followed was as described below.

***MET for Hip Adductor muscle:*** **[23]**

The players with groin pain were positioned comfortably in a supine position with the abduction of the affected hip joint. The physiotherapist stood on the affected side of the patient and placed his hands on the Anterior Superior Iliac Spine [ASIS] and the knee joint of the affected side. The players were advised to bring the hip into adduction against the moderate resistance applied by him. The players then contracted adductor muscle for 5 – 7 seconds and relaxed the same for 5 – 7 seconds. The technique was repeated seven times.

***Adductor Stretching Exercises:*** **[24]**

1. Adductor stretching was performed in both transverse and proximal directions towards the pubic bone. 2. FABER stretch 3. Self-stretching at home.

***Adductor Strengthening Exercises:*** **[25]**

1. Adductor Isometrics 2. Side-lying adductor strengthening 3. Adductor strengthening using resistance band 4. Sumo squat with resistance band 5. Side-lying with chair 6. V-sitting long-arm adductor 7. Adductor lunge 8. Adductor resistance with stepper

Three sets of each exercise [Stretching and strengthening] with ten repetitions for three days in a week for six weeks were given on nonconsecutive days.

***Group B [Control Group]:***

The same stretching and strengthening exercise protocol for adductor muscles was followed with the exact dosage for six weeks in the control group.

**Outcome Measures:**

1. ***A single examiner measures hip Rotation ROM (internal and external rotation).***

   Subjects were positioned in prone comfortably. A baseline [USA] goniometer was used to measure the hip rotation ROM. The movable arm of the goniometer was centered over the anterior midline of the measuring leg with the tibial crest as the reference. The Axis of the rotation was placed on the anterior aspect of the patella. The stationary arm was placed perpendicular to the floor. Active ROM was performed three times, among which the first two attempts were to stretch and warm up the muscle, and the last one was for the measurement. A gait belt stabilized subjects' pelvis, and manual pressure was applied to avoid raising the pelvis during measurement [26].

2. ***Kicking for Distance:***

   a. In-step Kick Distance.

   b. Front Kick Distance.

   These distances were determined as to how far the football player could kick the ball in a single shot concerning two different leg positions. The test was done on a relatively calm day, as the wind could be an extrinsic factor [for or against the player].

   The kick distance was measured on the football ground, marked at every five meters of cones. The distance from the point of kick to the point of the ball's first contact on the ground in meters was recorded. Each player was given three chances, and the maximum distance kicked by the player was recorded [27].

   These outcome measures were recorded at the baseline [before starting the intervention] and six weeks after intervention [post-test].

**Statistical analyses**

Means and SD for descriptive statistical parameters were calculated, and the data was documented in both experimental and control groups. The statistical analysis measured the pre and post-test mean and standard deviation of all the outcome measures [hip rotation ROM, instep and front kick distance. Statistical Package for the Social Sciences [SPSS] 20.0 version was used to analyze the data. The student's t-test was used for paired data [pre-test x post-test] in both groups. To identify the difference between the groups, student's unpaired 't' test and statistical significance were accepted at the 95% level ($P<0.05$) was used.

## RESULTS

Forty (40) football players with a history of adductor strain and groin pain participated in the study. All were males and were randomized into two groups, with 20 in each. Descriptive Statistics for the mean age, gender, height, weight, BMI, marital status, occupation, smoking habit, and the duration of playing football in a week, including their training session, were also recorded [Table 1].

**Table 1:** Distribution of the subjects with their characteristics.

| Characteristics | Classification | Group - A | Group - B |
|---|---|---|---|
| **Mean Age (yrs)** | | 21.5 ± 3.4 | 21.9 ± 4.2 |
| | | | |
| **Gender** | Male | 20 | 20 |
| | | | |
| **Height (cms)** | | 167 ± 6.32 | 168.1 ± 6.12 |
| | | | |
| **Weight (kg)** | | 64.89 ± 8.52 kg | 63.92 ± 7.87 |
| | | | |
| | | | |
| **Marital Status** | Single | 15 | 16 |
| | Married | 4 | 4 |
| | Divorced | 1 | 0 |
| | | | |
| **Smoking Habit** | Smoker | 12 | 13 |
| | Ex-smoker | 2 | 3 |
| | Non-smoker | 6 | 4 |
| | | | |
| **Occupation** | Ordinary Work | 3 | 2 |
| | Student | 10 | 12 |
| | Police / Military | 2 | 3 |
| | Education – Teacher / Faculty | 2 | 1 |
| | No work | 3 | 2 |
| | | | |
| **Body Mass Index [BMI]** | Normal | 19 | 18 |
| | Overweight | 1 | 2 |
| | | | |
| **Mean BMI** | | 20.56 ± 2.88 | 20.14 ± 3.51 |
| | | | |
| **Dominant leg** | Right | 18 | 19 |
| | Left | 2 | 1 |
| | | | |
| **Duration of playing football in a week [including training]** | 1 – 5 hrs | 1 | 1 |
| | 6 – 10 hrs | 3 | 4 |
| | 11 – 15 hrs | 16 | 14 |
| | > 15 hrs | 0 | 1 |

**Outcome measure parameters across the two groups at the End of the 6th week:**

Intergroup comparison of the experimental group [Group-A] showed an extremely significant difference

between the baseline and post six weeks of intervention in all the three parameters, hip rotation ROM (p< 0.003), In-step kick distance (p<0.04), and Front kick distance (p<0.04) [Table 2]. Similarly, the control group [Group-B] also showed a highly significant difference after six weeks of active exercises in all three outcome measures, Hip rotation ROM (p< 0.005), In-step kick distance (p<0.02), and Front kick distance (p<0.02) [Table 3]. The post-intervention mean scores between groups A and B were compared with student unpaired 't' test. Though there is a significant difference in the hip rotation ROM (p<0.005), no significant difference is found in both in-step kick distance (p<0.0001) and front kick distance (p<0.0001) [Table 4].

**Table 2:** Shows pre-test and post-test values of the variables in Group - A.

| Variables | Pre-test | Post-test | 't' value | 'p' value | Significance |
|---|---|---|---|---|---|
| Hip Rotation ROM | 46.68 ± 1.89 | 55.12 ± 2.247 | 16.45 | < 0.003 | Extremely Significant |
| In-step Kick Distance | 46.680 ± 2.34 | 50.79 ± 2.415 | 15.70 | < 0.04 | Extremely Significant |
| Front Kick Distance | 45.710 ± 3.42 | 49.91 ± 2.89 | 14.64 | < 0.04 | Extremely Significant |

**Table 3:** Shows pre-test and post-test values of the variables in Group - B.

| Variables | Pre-test | Post-test | 't' value | 'p' value | Significance |
|---|---|---|---|---|---|
| Hip Rotation ROM | 47.67 ± 1.87 | 53.33 ± 2.12 | 18.520 | <0.005 | Extremely Significant |
| In-step Kick Distance | 47.350 ± 2.15 | 50.28 ± 2.32 | 14.87 | < 0.02 | Extremely Significant |
| Front Kick Distance | 46.88 ± 2.76 | 50.84 ± 2.41 | 14.23 | < 0.02 | Extremely Significant |

**Table 4:** Shows post-test values of the variables between Group - A and Group - B.

| Variables | Post-test (Group – A) | Post-test (Group – B) | 't' value | 'p' value | Significance |
|---|---|---|---|---|---|
| Hip Rotation ROM | 55.12 ± 2.247 | 53.33 ± 2.12 | 4.87 | <0.005 | Significant |
| In-step Kick Distance | 50.79 ± 2.415 | 50.28 ± 2.32 | 1.24 | < 0.0001 | Not Significant |
| Front Kick Distance | 49.91 ± 2.89 | 50.84 ± 2.41 | 1.05 | < 0.0001 | Not Significant |

## DISCUSSION

In this study, we tried to find the effect of muscle energy techniques in managing groin pain among football players. For a sports person, an injury is an incident that prevents them from playing or practicing the game at least for 1-week time. In football players, groin pain is usually due to the adductor strain with tenderness on palpation of the adductor tendons and during resisted hip adduction. About one-third of the sportspersons experience groin injury and its related pain in their career [28]. In groin-related pain, adductor-related injury is considered one of the most definitive diagnoses, which account for between 51 to 64 percent among groin injuries [29,30]. The sportsperson tolerates insidious onset of this pain and unclear symptoms in attending training and playing a football game, thereby delaying them to seek medical attention immediately after an injury, which may lead to chronicity of the condition [31].

Muscle energy technique [MET] is used to treat sports-related injuries. It uses two physiological principles, namely post isometric relation and reciprocal inhibition, to reduce pain and muscle spasm and increase the shortened muscles and soft tissues [32-33]. For example, symptomatic football players with long-standing groin pain have significantly reduced hip adductor strength and hip range of motion than the uninjured footballers [34].

Reduced hip ROM is recorded during injury, immediately after the recovery, and in the training session. Thus, a complete history of the subject and detailed clinical examination is needed to confirm the adductor strain as the cause of the groin pain [4-5]. In this study, we found significant improvement of the hip rotation ROM in both the groups (p<0.003 & p<0.005) and highly significant in the subjects with MET training sessions (p<0.005). This change in the ROM is due to the lengthening of the adductor muscle caused by the mechanism of isometric contraction of MET. There is stretching of the series of elastic components of sarcomeres, mainly if active or passive stretching is obtained after MET [32]. MET involves repetitive submaximal active isometric contraction of a muscle followed by passive stretching, which may increase the muscle fiber's extensibility, thus resulting in increased ROM [35]. Football is a high-impact sport, with kicking as the most fundamental skill needed for the players. Kicking techniques (instep and front kick) alter the ball's speed and distance in the game. This speed and distance depend on many factors: accuracy of the kick, angulations in the lower extremity, the force generated by the muscle, different kinetics, and kinematics, and also the position of the supporting leg [36]. We found a significant improvement in the instep kick distance in both the experimental and control groups (p< 0.04 & p< 0.02), also there is a significant increase in their front kick distance before and after both interventions (p< 0.04 & p< 0.02). These findings were in line with previous research, which concluded that the hip-strengthening exercises improved the football players' performance (instep kick distance, front kick distance, and kick velocity) [26]. Though clinically, the subjects with MET and strengthening and stretching protocol reported better outcomes, the result is not statistically significant (p< 0.0001) for instep and front kick distance. This increase in the strength and ROM of hip adductors in the MET group is due to the change in the viscoelastic property of the muscle in addition to the increase in muscle extensibility, gained by the constant torque and force applied by the therapist to the muscle while performing the technique [37]. The main advantage of the muscle energy technique is that it involves the active participation of the subjects during the entire treatment session.

## CONCLUSION

The findings of this study indicate that the treatment in both groups effectively improves the hip rotation ROM, instep, and front kick distance in football players with groin pain due to adductor injury. Though adding MET to the routine strengthening and stretching exercise regimen improved hip rotation ROM clinically and statistically, the improvement in the instep and front kick distance is only significant clinically, not statistically. Nevertheless, this clinical improvement suggests that MET can be added in treating groin pain among football players.

**Acknowledgment**

The authors take the opportunity to thank all the participants of this study and the therapists who helped conduct this study. In addition, our special thanks to the Dean, Vice-Dean of Academic Affairs, Vice Dean of the Research and Scientific Activities, College of Applied Medical Sciences, Jazan University, Saudi Arabia, and the University of Hail, Saudi Arabia.

**Ethical Considerations**

Institutional Review Board approval was obtained before starting the research work.

**Conflict of Interest**

The authors have no conflicts of interest to report.

**Source of support / Funding:** The authors report no funding.

**Presentations at a Meeting: Nil.**

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