A Comparative Study of Muscle Energy Technique and Dynamic Stretching on Calf Muscle Group for Speed and Physical Endurance on Healthy Sprint Runners in School Level

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ABSTRACT

Backgroud: Athletes of all ages and skill levels use running as a popular form of exercise all over the world. The calf muscle complex is primarily responsible for propulsion during running gait. The gastrocnemius appears to be vulnerable to injury because of the strong stresses generated in this muscle during the push-off phase of running. According to reports, up to 30% of running-related injuries occur in the calf muscle region each year. Furthermore, lower leg soreness, gastrocnemius pain or strain, calf pain, calf spasm, and Achilles tendon injuries have all been reported as symptoms of calf injuries.

Aims of The Study: Aim of the study is to evaluate the effect of MET and Dynamic Stretching on calf muscle group for speed and physical endurance on healthy sprint runners in school level

Methods: Thirty-two subjects were divided into two groups. Group-A received Muscle energy technique (n=16) and Group-B trained with Dynamic stretching (n=16). Both groups received training of 5 sessions per week for 6 weeks. Outcomes were assessed by Bruce treadmill test and 40-yard sprint test before and after treatment.

Results: The study shows statistically significant improvement ($p<0.05$) in both groups for all the outcomes. After 6 weeks of training period, the group trained with muscle energy technique scored significantly higher in improving the endurance and speed than the group trained with dynamic stretching when the pre & post test values of Bruce treadmill Test and 40 yard sprint test were statistically analyzed using an independent 't' test.

Conclusions: Muscle energy technique was found to be much effective in improving the endurance and speed of sprint runners with improving flexibility of calf muscles than dynamic stretching technique.

Key Words: Muscle Energy Technique, Dynamic Stretching, Endurance, Speed, Flexibility, Calf muscles; Bruce Treadmill Test, 40 Yard Sprint Test.

INTRODUCTION

Running is a sustainable long term method of cardiovascular training.[1] The health benefits of running include a reduction in obesity, cardiovascular disease and type II diabetes.[2, 3] Running is generally described as either sprinting or endurance (distance) running.[5] Sprint running races are short-distance races in which athletes try to run at their maximum speed throughout the entire distance of the race.[6] As the speed of the athlete increases while running, the body needs to repeatedly produce force in the lower limbs at a rapid rate.[6]

Runners with the best economy while running have a higher energy storage capacity in the triceps surae musculotendinous unit than those with poor economy.[7] Tendon stretch and recoil reduce the amount of active muscle contraction required and stretch shortening cycles can occur at much higher velocities than those

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controlled by active contraction alone.[8] This may be linked to the decreased range of gastrocnemius reported by Craib MW, 1996.[9] There is also evidence that increased leg stiffness is associated with an increase in velocity and smaller stride lengths.[10]

MET have the ability to relax overactive muscles or stretch tight muscles and their associated fascial components when connective tissue or viscoelastic changes have occurred. When using MET, it is important to relax/inhibit the neuromuscular component before attempting to stretch the involved musculature. Two fundamental neurophysiologic principles accounts for neuromuscular inhibition that occurs with MET. The first principle is neurophysiologic of MET is post contraction inhibition (autogenic inhibition). After a muscle contracts it is automatically in a relaxed state for brief latent period. The second neurophysiologic principle that MET uses are the principle of reciprocal inhibition.[11]

Sprinters need muscle flexibility to improve their performance and lack of flexibility may lead to injuries. Muscle energy technique (MET) is the one which lengthens the muscle, increases the ROM and relaxes over active muscles or stretch tight muscles.[12]

Dynamic stretching (DS) has been recommended as an alternative to static stretching to increase muscle flexibility, it involves moving the limb from its neutral position to the end range, where the muscles are at their greatest length, and then moving the limb back to its original position. This dynamic action is carried out in a smooth, controlled manner and is repeated for a specified time period. The effect of DS protocols on muscle performance had been investigated, which generally has a positive relationship.[12,13]

METHODOLOGY

Study Design : Comparative study design

Sample Design : Random sampling

Sample Size : Total number of subjects 32, each group contains equal number of both Female & Male. i.e. [16 male and female]

- Group A –MUSCLE ENERGY TECHNIQUE (n= 16)
- Group B – DYNAMIC STRETCHING (n= 16)

Duration of the study: The duration required to complete the study was

- Data collection – 5 sessions per week for 6 weeks
- Statistical analysis – Before and after treatment subjects were asked to come for data collection

Study centre : Astra Multi Speciality Hospital, Department of Physiotherapy, (Bangalore)

Selection Criteria

Inclusion Criteria:

- Age: 10-12 years
- Any gender
- Subjects willing to participate
- Only sprint runners

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Exclusion Criteria

- Distance runners
- Inadequate strength in lower limbs or any vestibular or balance disorders
- Subjects with open wounds, bruises and lacerations, recent fractures or incomplete bony union, and varicose veins.

Outcome Measures

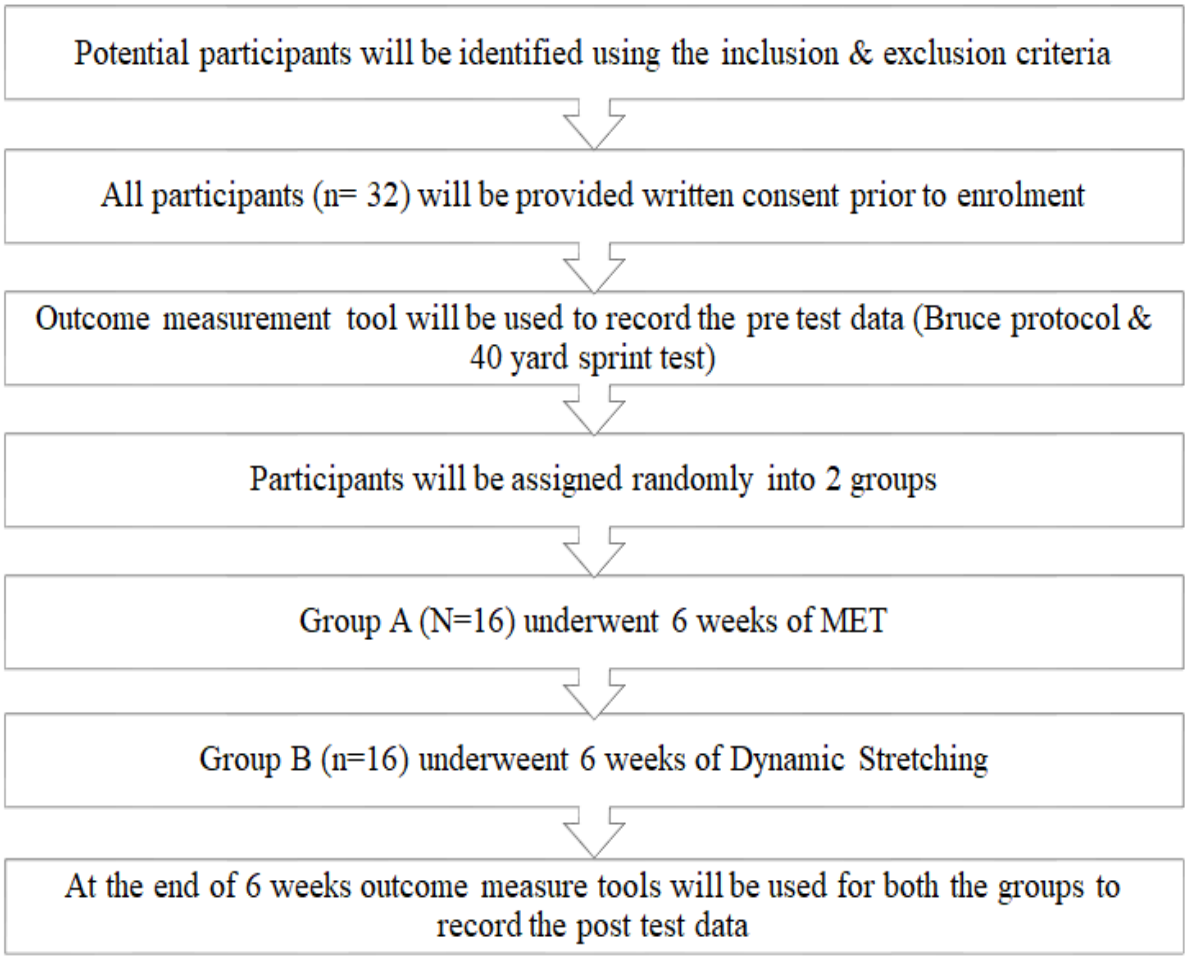
For Endurance: Bruce Treadmill test[14]

For Speed: 40-yard sprint test[15]

Procedure

Pre to post test comparative study design with two groups. The study was conducted through Astra Multi Specialty Hospital, Department of Physiotherapy, Bangalore, Karnataka. Total subjects were 32 with 16 in each group both male and female sprint runners were included based on selection criteria. The duration of exercise protocol given for 5 sessions per week for 6 weeks. After fulfilling the inclusion criteria and obtaining informed consent subjects was recruited for this study. **Group A** subjects received Muscle energy technique and **Group B** received Dynamic stretching. A pre test was done for each subject before stating exercises using Bruce treadmill test and 40 yard sprint test

Flow Chart for the Procedure of the Study:



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Group A (Muscle Energy Technique)

Figure: 1

Group B (Dynamic Stretching)

Figure: 2 (Brace Calf Stretch)

DATA ANALYSIS

INTER-GROUP ANALYSIS

Comparing the effects of Treatment A and B in terms of change in the value of Bruce Treadmill Test.

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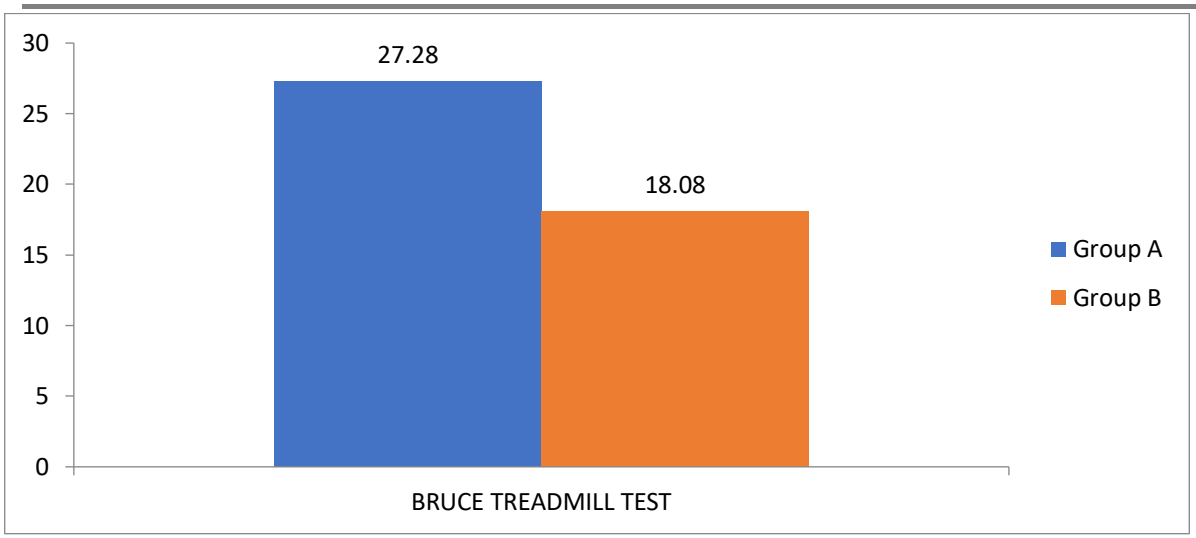
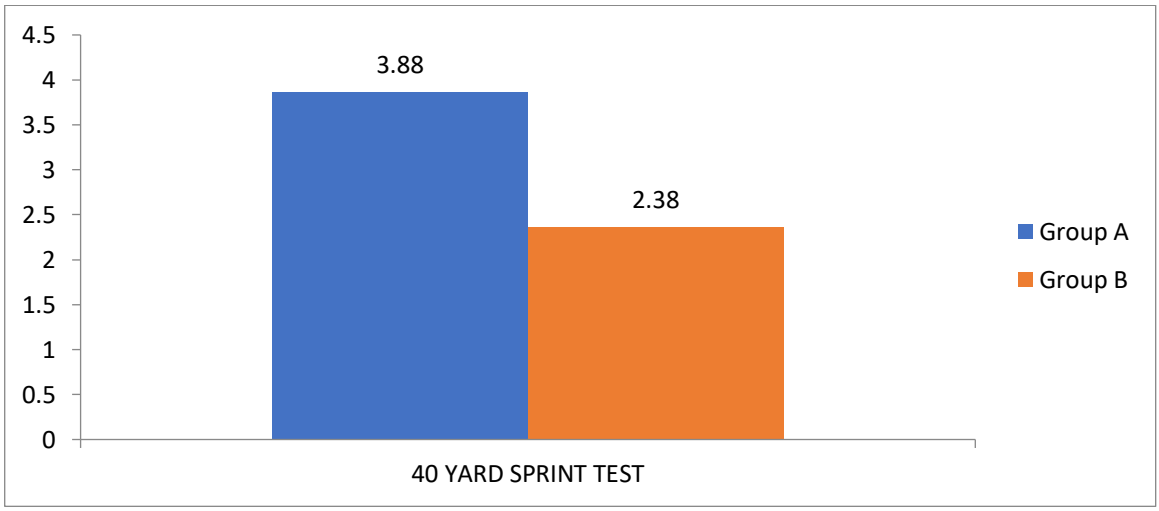


Graph: 1 (Bruce Treadmill Test)

Comparing the effects of Treatment A and B in terms of change in the value of 40 Yard Sprint Test.



Graph: 2 (40 Yard Sprint Test)

RESULT

GRAPH 1 concluded that there is **significant** difference between two treatments (A and B) in terms of average improvement in **BRUCE TREADMILL TEST** ($t = 1.9027$, $p = 0.033359<0.05$). In addition, the mean improvement in the value of Bruce Treadmill Test by Group A (27.28) is much greater than that of Group B (18.08). Hence concluded that **Group A treatment (MET) is significantly effective than Group B treatment (Dynamic Stretch)** in terms of mean improvement in the value Bruce Treadmill Test.

GRAPH 2 concluded that there **no significant** difference between two treatments (A and B) in terms of average improvement in **40 YARD SPRINT TEST** ($t = 1.50157$, $p = 0.71831>0.05$). In addition, the mean improvement in the value of 40 Yard Sprint Test by Group A (3.88) is not much greater than that of Group B (2.38). Hence concluded that **Group A treatment (MET) and Group B treatment (Dynamic Stretch) are equally effective** in terms of mean improvement in the value 40 Yard Sprint Test.

DISCUSSION

The present study showed that both Group A and Group B were shown to be equally effective in improving endurance and speed. There is a significant improvement in Bruce Treadmill Test and 40 Yard Sprint Test.

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However, the inter-group analysis showed that Group A treatment is significantly effective than Group B treatment in terms of improvement in values of a measure namely Bruce Treadmill Test and 40 Yard Sprint Test.

Flexibility exercises are used to increase the length of musculotendinous unit. The term flexibility exercise is often used synonymously with stretching exercises. Flexibility training has been shown to improve joint range of motion and prevent exercise induced muscle injury.

Hence, in this study, Group A (Muscle Energy Technique) shows significant difference in Bruce Treadmill Test and 40 Yard Sprint Test. Thus, the study showed better improvement in endurance and speed over the duration of 6 weeks.

LIMITATIONS & FURTHER RECOMMENDATIONS

Limitations:

- Study sample size is small
- Samples were healthy individuals
- Short follow up period

Recommendations:

- Study can be conducted on a large population
- Study can be conducted with long term follow up
- Other age groups can be involved
- Distance runners can be involved
- Other questionnaire can be included

CONCLUSION

In this study, both Group A and Group B were shown to be equally effective in improving the endurance and speed with sprint runners in school level. Comparing MET and Dynamic Stretching, Group A (MET) provides better improvement in endurance and speed than Group B (Dynamic Stretching).

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