Immediate Effect of Non Ballistic Active Knee Extension in Neural Slump Position Versus Muscle Energy Technique on Hamstring Flexiblity in Young Adults-Comparitive Study

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Abstract

Background and purpose: Amongst all of the bi-articular muscles of the human body hamstring have a greater tendency to shorten. Tightness of hamstrings produces decreased range of motion and reduce flexibility of the pelvis, hip and knee joints which can lead to musculoskeletal injuries. Muscle energy technique (MET) also known as active muscular relaxation technique is effective for lengthening a shortened muscles and increasing the range of motion. It is found that neuro dynamic tension technique also affects muscle flexibility and stretch tolerance. The purpose of this study is to evaluate the immediate effect of muscle energy technique verses non ballistic active knee extension in neural slump position on hamstring flexibility in young adults.

Materials and Method : 60 healthy individuals between the age group of 18-35 years with bilateral hamstring tightness without any previous musculoskeletal injuries were allocated into 2 groups by means of quasi random sampling. Hamstring tightness was measured using active knee extension (AKE) test. Group A was given neural slump stretch and group B was given muscle energy technique.

Results: For within group data analysis Wilcoxon test was applied where Group A and Group B showed statistically significant difference ($p<0.001$) in pre and post hamstring flexibility. Mann Whitney U test was used for between group analysis in which Group A(mean rank 35.22) showed a greater improvement than Group B (mean rank 25.78).

Conclusion: Both the techniques showed statistical as well as clinical significance in improving hamstring flexibility, however non ballistic active knee extension in neural slump position showed greater improvement than MET.

Keywords : *MET, hamstring flexibility , neural slump position, active knee extension (AKE) test , non ballistic active knee extension*

Introduction

Tightness is the adaptive shortening of the contractile and non contractile elements of the muscles which usually occurs in muscle groups in set pattern, with the biarticular muscles showing the greater tendency to shorten . The hamstring are the group of muscles that have a tendency to shorten even among young, healthy individuals and in recreational athletes.[1]. Hamstring tightness leads to high risk of recurrent injury, decreases the perfor-mance in athletes, lead to post-exercise soreness and decreases coordination among athletes. The hamstring muscles are commonly linked with movement dysfunction at the lumbar spine, pelvis and lower limbs, and have been coupled with low back

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pain and gait abnormality. Limited flexibility causes neuro-musculoskeletal symptoms. Decreased hamstring flexibility is a risk factor for the development of patella tendinopathy and patellofemoral pain hamstring injury and symptoms of muscle dam-age following eccentric exercise. Hamstring tightness are associated with a posterior rotation of the pelvis in standing due to attachment of hamstring muscle is on ischial tuberosity. Tightness in hamstring muscle causes posterior pelvic tilt which lead to decrease in lumbar lordosis result in low back pain.[2]. Worrell and Perrin (1992) proposed a theoretical model for hamstring strains, suggesting that they result from a complex interaction of four etiologic factors: warm-up, strength, fatigue, and flexibility.(3) Apart from the musculoskeletal causes, hamstring has also been shown to get tight due to increased tension in the neural structures. Gajdosik, pointed out that along with the hamstrings, the deep fascia of the lower limb and the soft tissues of the pelvis, including neurological tissues, can limit a straight leg raise test. In the same way these noncontractile tissues can come under tension during passive or active movements of hip flexion or knee extension.[1] Techniques previously investigated for hamstring flexibility include static stretching exercise, heat, and proprioceptive neuromuscular facilitation (PNF). Each of these interventions has demonstrated clinical and experimental success; no agreement has been reached on a standard protocol for treatment. Choice for a hamstring lengthening technique is typically based on provider specialty or preference. Muscle energy technique (MET) is a manual procedure that uses controlled, voluntary isometric contractions of a target muscle group. MET is claimed to be useful for lengthening a shortened muscle, improving range of motion at a joint and increasing drainage of fluid from peripheral regions. This approach which targets primarily the soft tissue is also known as active muscular relaxation [4]. Although abnormal muscle and tendon stiffness has been thought to be a cause of poor hamstring extensibility, several authors emphasised that abnormal mechanosensitivity due to sciatic nerve adhesion could potentiallyresult in decreased hamstring extensibility and stretch tolerance[5] Studies have shown that incorporating neuralmobilisation technique such as slump mobilisation into the treatment program can be an effective method of restoring normal neural tension and mechanics of the nervous system[1]. Therefore the need of this study is to compare the immediate effect of non ballistic active knee extension in neural slump position versus muscle energy technique on hamstring flexiblity in young adults.

Materials and Method

In this interventional study after obtaining ethical clearance a total of 60 subjects were included by screening according to the inclusion and exclusion criteria after obtaining an informed consent from the subjects. The subjects were divided into two groups with 30 subjects in each group. The criteria was as follows..

Inclusion criteria

1. Age group between 18-35 years.

2. Both males and females

3. Bilateral hamstring tightness (knee flexion angle greater than15 degrees for active knee extension test)

Exclusion criteria

1. Subjects with any present or previous musculoskeletal injuries.

2. Individuals engaged in regular physical activity.

Procedure

The subjects were divided into 2 groups by quasi random sampling method after a consent was provided by the subjects . Where **Group A** was given non ballistic active knee extension in neural slump position and **Group B** was given MET.

Group A

Group A Patients were then instructed to perform 30 repetitions of active knee extension maintaining the full dorsiflexion, upto the point where the firm resistance or stretch was felt at the posterior thigh, knee or calf and position was held for the self count of one, two, three, four by the patient The position was held for 6 seconds and 30 repetitions were done.[1]

Group B

While the subject was lying in supine position, the subject's hip was passively flexed and the leg extended until tension was sensed by the researcher and the subject reported a moderate stretching sensation. The subject provided a moderate knee flexion isometric contraction (approximately 50% of maximal contraction), by pressing his ankle joint against the top of the researcher's shoulder for 7–10 s. This was followed by 2–3 s of relaxation, and then the leg was passively stretched by the researcher to the palpated barrier and/or tolerance to stretch and held for 30 s. The leg was then lowered to the table for a short resting period (approximately 10 s). This procedure was repeated two more times. [4]

(a) isometric contraction

(b) stretching post isometric contraction.

Outcome Measure : Active Knee Extension Test (. ICC values 0.87 – 0.94)

Hamstring tightness was measured before the treatment at baseline by active knee extension test (AKE) and immediately after the treatment. The AKE consists in an active extension movement at the knee joint (with the hip flexed at 90°), in which the subject is instructed to stop when he feels strong resistance to the movement.[6]

Active knee extension test

Statistical Method

After the collection of data , analysis of data was done in SPSS VERSION 20. Shapiro-wilk test was used to check normal distribution of data. The data did not follow a normal distribution therefore non parametric tests were used. For a within group analysis WILCOXON SIGNED RANK TEST**.** For a between group analysis MANN WHITNEY U TEST. P value less than 0.05 is taken as significant level.

Results

TABLE 1 : AGE AND GENDER DISTRIBUTION IN BOTH THE GROUPS.

GROUP	**Gender distributiom**	**AGE (YEARS) MEAN±SD**
GROUP A (NEURAL SLUMP)	Male : 14 Female : 16	24.56 ±4.19
GROUP B (MET)	Male : 17 Female :13	24.53±4.27

TABLE 2 : SHOWS THE WITHIN GROUP ANALYSIS BY WILCOXON SIGNED RANK TEST FOR THE PRE AND POST VALUES OF AKE TEST

Group	Pre Mean±SD (in degrees)	Post Mean±SD (in degrees)	P value
A (neural slump)	102.48±3.7	120.31±8.5	0.0001
B (MET)	105.18±3.9	115.33±6.9	0.0001

- As bilateral hamstring tightness was considered with regard to statistics a mean value of both the sides was taken as the final value per each subject.

TABLE 3 : **SHOWS BETWEEN GROUP ANALYSIS OF THE POSTVALUES OF AKE BY MANN WHITNEY U TEST.**

GROUP	P VALUE
BETWEEN A AND B	0.03

Discussion

Results of this study showed that both MET and slump stretch showed a clinically (**Minimal detectable change is 7–8°for AKE**) [6] as well as statistically (P <0.05) significant difference in improving hamstring flexiblity however slump stretch showed a greater improvement. As MET showed a significant improvement in muscle flexiblity which is supported by a similar study conducted by Adel Rashad Ahmed that compared the effect of Muscle Energy Technique and Dynamic Stretching on Hamstring Flexibility in Healthy Adults . It was reported that the application of post-isometric stretching technique, such as MET, produce greater changes in range of motion and muscle extensibility than static or ballistic stretching14,17. It was concluded that 30 seconds as the optimal duration for an effective stretch, MET may produce an increase in muscle length by a combination of creep and plastic change in the connective tissue22. The probably mechanism of increasing muscle extensibility involves both neurophysiological (including changes to stretch tolerance) and mechanical factors (such as viscoelastic and plastic changes in the connective tissue elements of the muscle). Also, the effectiveness MET was attributed to the inhibitory Golgi tendon reflex. This reflex is believed to be activated during isometric contraction of muscle, which is claimed to produce stretch on the golgi tendon organs and a reflex relaxation of the muscle [4].this was further supported by a study carried out to examine Efficacy of Muscle Energy Technique on hamstring muscles flexibility in normal Indian collegiate males. By Wassim M et al which also attributed the improvement in hamstring flexibility to combination of creep and plastic change in the connective tissue , an increase in flexibility after muscle energy technique (MET) occurred due to biomechanical or neuro-physiological changes or due to an increase in tolerance to stretching[7].

Also neural slump stretch showed a clinical as well as statically significant difference on hamstring flexiblity when compared with MET. Supporting this finding a study done by Gadpal Pratiksha, Asgaonkar Bharati showed immediate effect on hamstring flexiblity by comparing non ballistic active knee extension in neural slump position and static stretch technique and found slump stretch to give better results. According to shacklok ,damaged or inflamed nerves leads to increase in mechanosensitivity which is a direct response to mechanical loading of the neural structures. This can lead to increased knee flexion angle in AKE. The possible mechanism of reduced knee flexion angle post neural stretch can be attributed to the improved physiological functions of nervous system, including improved axoplasmic flow, vascular perfusion and reduced neuromeningeal mechanosensitivity (perceptions of stretch or pain were altered). Thus there are many proposed mechanism of improvement of hamstring flexibility by neural slump position. But reduced mechanosensitivity is the chief mechanism by which the nervous system becomes more tolerant to source of pain with movements and postures[1] A similar study , examining the immediate effect of neurodynamic sliding technique verses mulligan's bent leg raise technique on hamstring flexibility in a symptomatic individuals by vinod babu et. Al found that , In NDST group, who received Neurodynamic sliding technique showed that there is a statistically significant change in means of passive SLR ROM, when means were analysed from pre intervention to post intervention measurements within the group with positive percentage of change showing there is increase in post means. There is a clinical significant effect with large effect size. This could be due to neurodynamics sliding technique, when tension is applied to the nervous system while applying neurodynamics, it causes reduction in cross-sectional area and increase in pressure in the nerve that results in extension and movement of the sciatic nerve together with the hamstring and this compliance of the nerve, results in increased flexibility. When applying neurodynamics, tension that occurs in the nervous system and pressure within the nerve increases due to the decrease in cross-sectional area, and the axonal transport system lengthens the sciatic nerve after shortening because of the influence of the surrounding related structures and hamstring flexibility.The observed changes may have been secondary to decreasing neuromeningeal sensitivity or may be that the neurodynamic sliders led to a modification of sensation such that the individual's perceptions of stretch or pain were altered [8] Further this mechanisms which improved the hamstring flexibility were supported by a the following study , A Randomised, Placebo-Controlled Trial of Neurodynamic Sliders on Hamstring Responses in Footballers with Hamstring Tightness by Pattanasin Areeudomwong et al. This study demonstrated that a 4-week Neurodynamic sliding (NS) technique improved knee extension angle, which reflected apparent hamstring extensibility without causing any significant changes in th hamstring activity in footballers with hamstringtightness. There were three proposed mechanisms to explain the greater knee extension angle after NS. First, increased knee extension angle may be due to changes in the individual's tolerance of the stretch , and the strong afferent input from the acute stretch may reduce firing rates of mechanoreceptors and proprioceptors that may also affect sensory adaptation and allow increased joint ROM . Second, NS may provide more excursions of the neural structures at the vertebral canal, the buttock, and especially the sciatic nerve in the posterior thigh. It may also decrease the neural mechanosensitivity that may play a factor in determining an increase in apparent hamstring extensibility . Third, NS may induce sliding of the sciatic nerve at the thigh relative to its nerve beds by performing joint movements that elongate the nerve beds and the fascial system, including the hamstring muscles . This may allow increased joint ROM. [5]

Conclusion

From this study it is concluded that both the techniques showed statistical as well as clinical significance in improving hamstring flexibility, however non ballistic active knee extension in neural slump position showed greater improvement than MET.

Limitations and Scope of Further Research: Long term follow up was not done it is not known how long the observed increase in hamstring flexibility might have lasted. Subjects with musculoskeletal disorders were not included therefore the scope of further research is that this techniques could be applied in musculoskeletal disorders.

Conflict of Interest : none

Source of Funding: self

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