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A Randomized Controlled Trial to Compare the Effectiveness of Static Stretching Versus PNF Stretching of Hamstring Muscles Following Superficial Heat in Athletes

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Abstract- Flexibility is an essential fitness component that decrease with age and immobility can lead to change in muscle and joint function postural alignment and host of indirect impairments like muscle tightness , atrophy, fibrosis, contracture, joint analysis, postural deformity. Tight hamstring muscle may be a potential risk factor for strain injuries in sports, in which a full range of motion is needed. The stiff and short hamstring muscle tendon unit may be a risk factor for low back pain and the development of patellar tendinopathy. At present various interventions are available to increase flexibility of hamstring muscle. However, there are not many studies that have analyzed the effects of static stretching and proprioceptive neuromuscular facilitation stretching of hamstring muscles following superficial heat in athletes. The aim of the study was to find out the efficacy of effectiveness of static stretching and PNF stretching of hamstring muscles following superficial heat in athletes.

Thirty subjects were randomly assigned into 2 groups. Group A hamstring stretching was given and Group B proprioceptive neuromuscular facilitation was given. Outcome was evaluated by range of motion. Study shows after the treatment session. both the groups show a significant increase in active knee extension range of motion. It shows that both the methods of stretching were effective but the PNF group shows more improvement than static group, so the PNF stretching is more effective than static stretching.

Index Terms- Hamstrings, Flexibility, AKE, Stretching, PNF

I. Introduction

Flexibility is a key component for injury prevention and rehabilitation (Odunaiya 2005). Zachezeweski has defined muscle flexibility as the ability of a muscle to lengthen, allowing one joint to move through a range of motion and a loss of muscle flexibility as decrease in the ability of muscle to deform resulting in decreased range of motion (William 2012). Tight hamstring muscle may be a potential risk factor for strain injuries in sports, in which a full range of motion is needed. The stiff and short hamstring muscle tendon unit may be a risk factor for low back pain and the development of patellar tendinopathy (Ylinen 2009). As documented in several studies, incidence rates of hamstring strains range between 7.1% and 30% with relatively high recurrence rates between 18% and 34 %(Nagrawal 2010). A tight hamstring causes increased patellofemoral compressive force, which may eventually lead to patellofemoral syndrome (Odunaiya 2005). Muscular stretching has a great importance in preventing injuries and developing skills and physical ability. Many muscular stretching methods, exist such as dynamic stretching (ballistic), static stretching and stretching by the proprioceptive neuromuscular facilitation (PNF) (Rashad 2010).

Various Proprioceptive neuromuscular facilitation stretching techniques based on Kabat's Concept are: Hold relax, contract relax and contract relax-antagonist contract etc. (Nagarwal 2009) Proprioceptive neuromuscular facilitation training has a safe and better effect on hamstring muscle's flexibility, strength and endurance (Mohammadi 2012).

Although, effect of static and PNF stretching have been well documented in sport science, there have been only a limited amount of studies evaluating the same factors for rehabilitation purposes (Daneshmandi 2011).

The present study was undertaken with the intention to compare the effectiveness of static stretching and the PNF stretching of hamstring muscles following superficial heat in athletes.

II. Material and Methods

This study was approved by Research and Ethical committee of University College of Physiotherapy, Faridkot. Athletes were taken from the Government Barijindra College and Baba Farid law college. Informed consent was signed by each participant. A randomized controlled trial with equal randomization (1:1 for two groups) were done with 15 patients in each group, total (n=30). The inclusion criteria age was 18 to 23, both male and female, tightness of hamstring muscle, limited hamstring extensibility as determined by active knee extension angle less than 160 degree or less than 90 degree while hip is in flexed position, subjects who were injury free in the trunk and lower extremities from last 6 months. The exclusion criteria was athlete with hamstring spasm, or tendinopathy within the last 6 month, history of back or knee joint pain, inflammatory conditions of hip or knee joint, any medical condition that could be exacerbated by therapeutic heating, any osteoarthritis or any current musculoskeletal disease, signs and symptoms of delayed onset muscle soreness, upper motor neuron disease and lower motor neuron disease, who were taking analgesics or anti-inflammatory drug.

Intervention

Athletes were divided into two groups based on randomization and inclusion and exclusion criteria. Treatment was given for 5 days per for 4 weeks duration. The follow up was at the base and 4th week.

In Group A 15 participants were selected. The moist heat packs were given over the posterior aspect of thigh for 10 minutes. During stretching program the participant were in supine position with their other extremity strapped down the table. For each stretch, the investigator passively flexed the hip with knee fully extended, allowing no hip rotation. The lower leg was rested on the investigators right shoulders. The hamstring muscle was stretched until the subject first reported a mild stretch sensation. 3 repetition of hamstring stretching were given.This was followed by static stretching. The stretched position was held for 30 secs, followed by 10 sec rest. The stretching was given five days a week for four weeks.

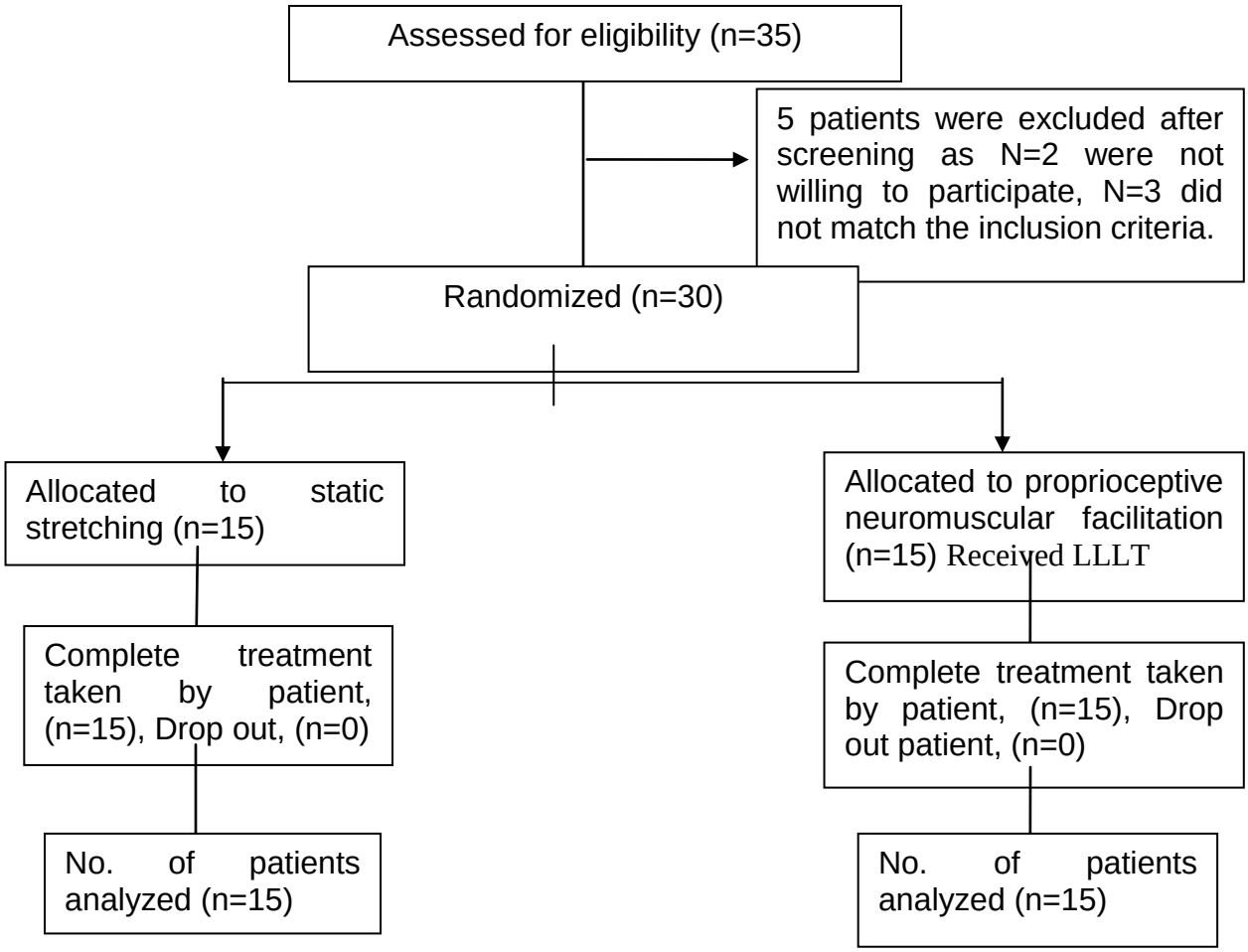


Fig 4.1 Flow Chart of treatment program

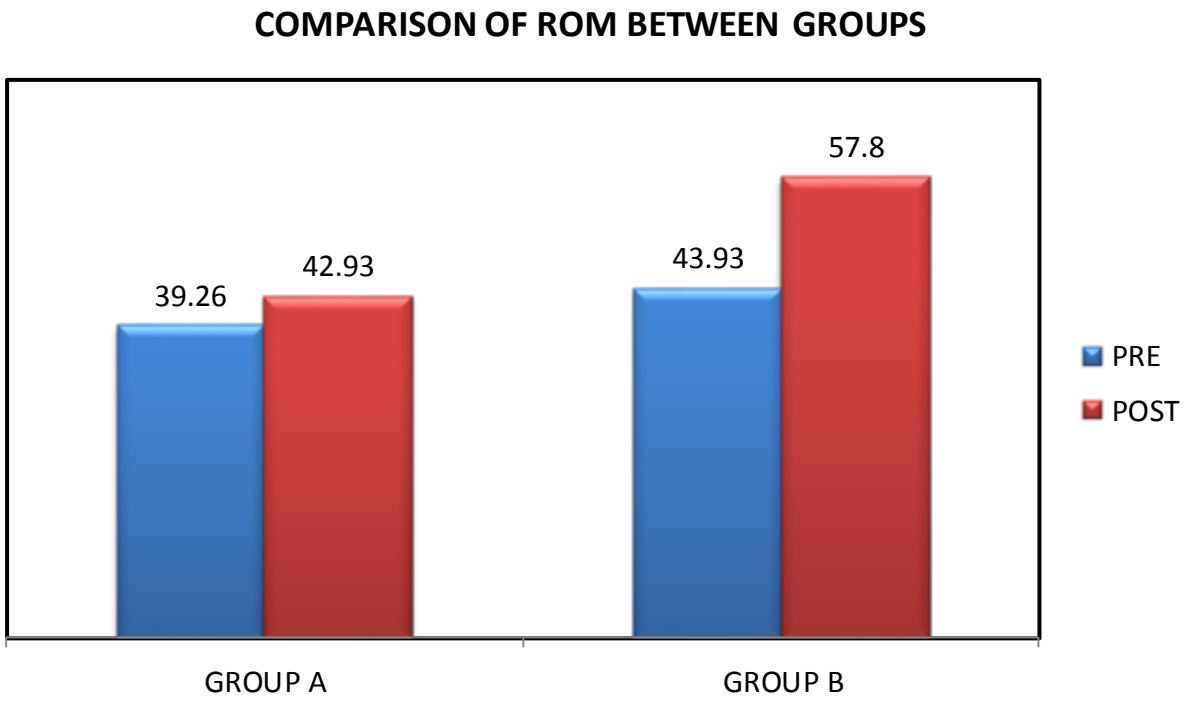
In Group B 15 athletes were included and were given PNF stretching followed by moist heat pack. During stretching program athletes were in supine lying position with knee extended and foot in neutral position. Hip was flexed until tension in hamstring muscle group was felt by the participant. The hamstring muscle was stretched until the participant first reported a mild stretch sensation and position was held for 7 secs than ask the participant to contract isometrically the hamstring muscle for 3 sec and 20 sec relaxation. This sequence was repeated for 5 times. This stretching was given five days in a week for four weeks.

III. Data Analysis

The data obtained were analyzed using SPSS. t-test was used to determine the effectiveness of static stretching and PNF stretching following the superficial heat on the athletes. Unpaired t test was used for within group comparison of both groups. The level of statistical significance was set at a p value of 0.05.

IV. Results

Unpaired t test was done within Group A and Group B to analyze the significance of age. The mean age of subjects in group A was 22.26 and that of group B was 20.40 respectively. The unpaired t test value was 2.135 ($p = 0.042$).There was no significant difference in the age group. Comparison between the ROM of both the groups has been done. There was significant difference in ROM between pre values of both the groups with mean values of 39.26 and 49.93, but in post values of ROM, there was a significant difference in the ROM between both groups ($p<0.01$). Group B showed highly significant improvement than Group A in ROM with mean value of 4.66 (Group A) and 14.86 (Group B) after 4 weeks of treatment.
Group B showed highly significant improvement than group A in ROM with mean value of 14.86 (Group B), 4.66 (Group A)



V. Discussion

We found significant improvement in athletes with group B than group A i.e PNF stretching is more effective then the static stretching for hamstring muscles following the superficial heat in athletes.

The static stretching showed the significant improvement in hamstring flexibility, the pre treatment mean ROM was 39.26 and after the static stretching it was 49.93. This is because the static stretching exhibits the mechanism of action that static stretching exercise causes plastic stretching which results in irreversible tissue elongation (Turner et al, 1988). A stretching activity causes a neural inhibition **o**f muscle group being stretched. The neural inhibition reduces reflex activity which causes greater relaxation and decreased resistance to stretch (Daneshmandi Hassan at el, 2011)

The PNF stretching showed the significant improvement in hamstring flexibility, the pre treatment mean ROM was 42.93 and after the static stretching it was 57.80. A number of studies have demonstrated that ROM significantly increased after the PNF stretching exercise protocols. Handel et al (1997) found increase in active and passive ROM after 8 weeks of CRPNF stretching training. Similarly Schuback et al (2004) observed the effectiveness of self-stretch incorporating PNF components involving a therapist-applied PNF technique (Daneshmandi Hassan at el.2011).

VI. Conclusion

This study concluded that both static stretching and proprioceptive neuromuscular facilitation are found to be effective in increasing the range of motion and improving the flexibility. However it is concluded that proprioceptive neuromuscular facilitation is more effective than the static stretching. In addition it is statistically proved that range of motion, flexibility status were improved at two weeks with statistical significance of $p<0.005$.

Proprioceptive neuromuscular facilitation stretching in normal athletes leads to improved flexibility and range of motion status as compared to static stretching.

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