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Effect of Jack Knife Stretching Versus Proprioceptive Neuromuscular Facilitation (Hold Relax) Stretching Technique in Asymptomatic Individuals with Hamstring Tightness: A Randomized Clinical Trial

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Abstract

Background: Study is to compare the effectiveness of Jack knife stretching and Proprioceptive Neuromuscular Facilitation (PNF) stretching Technique in asymptomatic individuals with hamstring tightness.

Aims and Objectives : 1. To study the effect of jack-knife stretching on the individuals with asymptomatic hamstring tightness in terms of Active knee extension test, finger to floor, passive SLR and LEFS Questionnaire.2.To Study the effect of PNF stretching on individuals with asymptomatic hamstring tightness. 3.To compare the effect of Jack knife and PNF stretching in individuals with hamstring tightness.

Material and Method: Ethical approval was obtained. 56 healthy subjects were assigned into two groups. PNF (hold relax) stretching technique was given to the Group A and Group B received Jack Knife stretching. Active knee extension test, Finger to floor test, Passive single leg raise test and Lower extremity functional scale these parameters were measured .

Results: Intra-group comparison for all the outcome measures in both the groups showed statistical significance. Inter-group comparison for all the outcome measures for both the groups had differences but showed statistical significance. Group B Jack knife stretching was more effective than group A PNF (hold relax) stretching.

Conclusion: The present study results indicate that to increase hamstring flexibility both the treatment techniques i.e PNF stretching and jack knife stretching are effective in asymptomatic individuals with hamstring tightness. Thus, our study shows jack knife stretching gives immediate effect due to closed pack position of stretching compared to open pack position of PNF group

Keywords: *Hamstring Tightness; PNF Stretching, Jack Knife Stretching*

Introduction

Almost everyone, regardless of age knows and values the ability to function as independently as possible during activities of daily life.[1] Humans have the capability to produce infinite variety of postures and movements that will need the structures of human body to both generate and respond to forces that produces and control movement at the body's joints.[2] The movement occurring in the human body is caused by the musculature system.[3] There are about 700muscles,which are attached to the bones of the skeletal system that make up up-to half of the person's body weight. Hamstring muscles is situated at the posterior part of the thigh. It includes 3 muscles – biceps femoris muscle, semitendinosus

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muscle, semimembranosus muscle. These muscles share some common characters of which is its origin which is from ischial tuberosity and its insertion into one of the bones of the leg. Nerve supply to these group of muscles is from the tibial part of sciatic nerve. These muscles function together for the flexion of the knee (front bending of the knee) and helps in the extension of hip (moving the hip backwards). These muscles also help in rotating the knee.[4] According to Darlene Hertling, the term muscle tightness refers to adaptive shortening of the contractile and non-contractile elements of muscle.[5] Inability to achieve more than 160 degree of knee extension with hip at 90 degree of flexion is considered as hamstring tightness .Hamstring tightness can be treated successfully in many ways like with cryotherapy, thermotherapy, stretching and spray, ultrasound, soft tissue massage, shortwave diathermy, myofascial release, and muscle energy technique, bowen technique[6,7]

Jack knife stretch for improving the hamstring flexibility was tested by Michelle Hamiton.[8] Benefits of these stretch include improvement of the blood flow to the lower extremities, relaxation of tight hamstring and many more .[9]The stretch is to be held for 5 second's and is to be repeated 5 times, 2 sets every day.

Hold relax PNF stretching facilitate muscle relaxation and increases the range of motion. This PNF stretching is facilitated by the Golgi tendon organ. The stretch is to be held for about 6 seconds and is to be repeated thrice and is then repeated on the other side. Outcome measures which are being used in study are lower extremity functional scale (LEFS), active knee extension test, popliteal angle, finger to floor test and passive SLR test.

Aims and Objectives

1. To study the effect of jack-knife stretching on the individuals with asymptomatic hamstring tightness in terms of Active knee extension test, finger to floor, passive SLR and LEFS Questionnaire.

2. To Study the effect of Proprioceptive neuromuscular facilitation stretching on individuals with asymptomatic hamstring tightness in terms of Active knee extension test, finger to floor, passive SLR and LEFS Questionnaire. 4

3. To compare the effect of Jack knife stretching and Proprioceptive neuromuscular facilitation stretching in individuals with asymptomatic hamstring tightness in terms of Active knee extension test, finger to floor, passive SLR and LEFS Questionnaire

Methods & Methodology

Ethical approval was obtained from the Institutional Ethical Committee and written consent was obtained from the participants of our study. The present randomized clinical trial was carried out among 56 normal healthy subjects which comprised of both male and female between the age of 18-24 years and were assigned into two groups. PNF (hold relax) stretching technique was given to the Group A and Group B received Jack Knife stretching technique. Six alternate sessions were given to both the Groups for two weeks. Active knee extension test, Finger to floor test, Passive single leg raise test and Lower extremity functional scale these parameters were measured pre intervention and post intervention.

Procedure

The purpose of this study was explained to all the subjects volunteered in the study. A written informed consent was also obtained from all the subjects. The subjects were then screened upon the basin of the inclusion and the exclusion criteria and were selected based on the inclusion criteria. Subjects were explained about: Pattern of study, Need of study, Information generated out of the study. Once the consent was taken detailed information was gathered and statistical analysis was done in order to derive conclusion. Subjects in both the group's, PNF (hold-relax) group and the jack-knife group were assessed before starting the treatment. Demographic data was collected with the initial assessment of the pre-treatment measurements of finger to floor test for flexibility of the hamstring muscle, active knee extension test to measure the popliteal angle, passive SLR test to check the range of motion and the lower extremity functional scale to check the limitations of work due to tight hamstrings.

PNF(hold-relax) Group

1. The subject is told to lie down in a supine lying position.

2. The subject is then told to take a belt which he/she has to place it under the sole of the foot, the two ends of which will be held by the patient.

3. The other leg of the Subject is stabilized by the belt to the table.

4. The subject is now asked to raise his leg straight with knees in extension to the level the where he cannot take his leg further and hold the position with the help of the cloth for 30seconds and then relax repeating it 3times.

5. Alternate day intervention will be given for 2 weeks.

Jack-knife Group

1. In this techniqe subject is asked to squat completely and hold the ankles from behind and then instructed to extend the knees holding the ankle wherein the chest the subject is in complete contact with the thigh.

2. This position is held for 5 seconds and is repeated 5 times.

Jack knife Stretching

Result

Components of demographic data such as age, height, weight, BMI were analysed and compared between the two groups. Pre intervention measurements and post intervention measurements were compared between the groups (intergroup comparison) by using independent t-test. Probability values less than 0.05 were considered statistically significant. To find the significance of the study parameters between two groups paired t-test was used. and Kolmogorov smirnov test was used to find the pair wise significance of the outcome ±measures i.e active knee extension test, passive SLR, finger to floor test and LEFS.

The mean± SD before intervention is 34.86±9.28 and after intervention is 46.8± 9.60 in PNF group and mean± SD pre intervention is 31.43±8.47 and post intervention after 2 weeks is 49.8±10.7 for active knee extension by independent t test in Jack knife group.For finger to floor test pre intervention mean± SD is 17.16 ±6.47 and post intervention 9.19±3.65 for Group PNF. Mean± SD for group Jack knife pre intervention is 17.96±6.49 and post intervention is 7.43±6.22.In passive SLR Baseline mean

±SD is 68±13.31 and after treatment it is 79.6±9.05 for PNF group and baseline and post intervention mean± SD for jack knife group is 66.14±9.85 and 82.6±8.46 respectively. LEFS score baseline mean± SD is 74.25±4.62 after 2 weeks of intervention it is 77.43±266 for PNF group and in jack knife group pre intervention score is 73.36±4.50 and post intervention 78.36±2.26 .

Discussion

The present study was conducted to compare the effects of jack knife stretching and PNF (Hold relax) stretching on asymptomatic subjects with hamstring tightness. An alternate day intervention was done for two weeks (six sessions) to see which stretching technique is more effective in increasing hamstring muscle flexibility in terms of Active knee extension test, passive single leg raise test, finger to floor test and lower extremity functional scale.

Koichi sairyo has done study on tight hamstring muscle for four week by using jack knife stretching .Pelvis forward inclination angle (PFIA) and finger to floor distance (FFD) were the parameters included in the study. FFD was 14.1 ± 6.1 cm before the intervention and decreased to -8.1 to 3.7 cm by the end of 4 week. Which indicated the gain of hamstring flexibility by 22cm. PFIA was 50.6± 8.2 before the experiment and 83.8± 5.8 degree after the intervention was given. Before and after the experiment difference of outcome measure were siginificant ($\rho<0.05$) which concluded that jack knife stretching is useful technique to improve flexibility of tight hamstring[10]. After the application of jack knife stretching for 6 alternate sessions for two weeks, our study showed significant improvements in hamstring flexibility in terms of finger to floor test, lower extremity functional scale and increase in range of motion in terms of active knee extension test and passive single leg raise test. Scott G. Spernoga , timothy et al conducted a study to see the duration of maintained hamstring flexibility after a one time modified hold relax PNF stretching protocol concluded that 5 min. of hold relax stretches. produced significantly increased hamstring flexibility that lasted for 6 min after the stretching protocol was given.[11] One study was done by marvin c. Tanglawa in comparing the hold relax PNF stretching and passive mobilization on increasing hamstring muscle length concluded that the subjects receiving the PNF hold relax stretching increased their range of passive single leg raise to a higher degree and at a faster rate than the subjects receiving passive mobilization.[12] A study carried out by by Jill M Binkley et al to assess the reliability, validity and sensitivity of Lower Extremity Functional Scale (LEFS) concluded that the test retest reliability of LEFS scores were excellent (R= 0.94 with … interval = 0.89) and that LEFS is efficient to administer and is applicable for research purpose as well as for clinical practice .[13] A study undertaken by Michelle Hamilton to compare if standing jack-knife stretch is better than seated for hamstrings included 17 youths aged between 8-18 years with back pain who performed 2 sets of stretch twice a day for 04 weeks. One set consisted of 5 repetitions of jack-knife stretch holding it for 5 seconds and FTF forward bend test was taken to establish a baseline of flexibility. This study concluded standing jack-knife stretch increases flexibility in hamstrings[14].After the application of jack-knife stretching technique for six sessions alternatively for 2 weeks our study also showed improvement in the flexibility of hamstrings to a greater extent when measured for FTF test, PSLR test, AKET and LEFS. hence our study came to a conclusion that, Jack-knife stretching technique and PNF(hold-relax) stretching technique when compared are equally effective in increasing the hamstring flexibility and ROM when administered for six sessions alternatively for 2 weeks .It also concluded that Jack-knife group showed significantly more improvement then PNF (hold-relax) group in terms of FTF, PSLR, LEFS and AKET.As per our knowledge, this is the first study comparing the effect of Jack-knife and PNF(hold-relax) on hamstring flexibility in healthy individuals with alternate 6 day sessions intervention .Hence jack knife starching showed immediate effect on hamstring tightness as it is closed pack position, PNF stretching technique is in open pack position which again one of the impact factor for the result .Hence both the techniques can be used clinically to increase the flexibility and range of motion of the hamstring muscle.

Conclusion

The present study proves that both the stretching techniques that is Jack knife and Proprioceptive neuromuscular stretching are equally effective for increasing the flexibility of hamstring muscles in individuals with asymptomatic hamstring tightness. However, jack-knife stretching technique showed immediate effect on hamstring tightness compared to Proprioceptive neuromuscular facilitation stretching. Thus, both the stretching can be used in clinical practice for improving the flexibility of hamstring muscle

Conflict of Interest: Nil

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Ethical Clearance: Ethical clearance was obtained from KAHER institute of physiotherapy Institutional Ethics Committee on Human Subjects Research

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