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A Study to Compare the Effects of Mulligan Traction Straight Leg Raise Technique, and Propeoceptive Neuromuscular Facilitation (Hold Relax) Technique on Tightness, and Strength of Hamstring Muscle Among Young Adults

Sachin Girdhar[1], Swati Nagpal[2], Soumik Saha[3], Chahat Sharma[4]

[1]M.P.T (orthopedics), Department of physiotherapy, DAV IPTR
[2,3]Assistant professor, Department of physiotherapy, DAV IPTR
[4]M.P.T (neurology), Department of physiotherapy, DAV IPTR

Abstract

Supervisor- Dr. Swati Nagpal, Mpt (Orthopedics), Assistant Professor, D.A.V.I.P.T.R, Jalandhar.

Background- Flexibility Is Defined As The Ability Of A Muscle To Lengthen, Allowing One Joint Or More To Move Through A Range Of Motion (Rom), And Is An Essential Component Of Normal Biomechanical Functioning. Hamstring Tightness Can Occur Due To The Sedentary Lifestyle Which Is The Main Reason For Postural Abnormalities. Therefore, It Is Important To Have Optimal Muscle Flexibility For Optimal Performance. In This Line Of Thought, The Present Study Is Designed To Compare The Effects Of Mulligan Traction Straight Leg Raise Technique And Proprioceptive Neuromuscular Facilitation Hold Relax Technique On Hamstring Tightness Among Young Adults.

Aim Of The Study- "To Compare The Effects Of Mulligan Traction Straight Leg Raise Technique And Proprioceptive Neuromuscular Facilitation (Hold Relax) Technique On Tightness And Strength Of Hamstring Muscle Among Young Adults".

Methodology- The Total Duration Of The Study Was One And A Half Year. Subjects Meeting The Inclusion And Exclusion Criteria Were Selected In The Study. A Minimum Of 60 Subjects, Both Male And Female With Age Between 18-25 Years, Were Selected For The Study And Subsequently Divided Into Three Groups With Minimum Of 20 Subjects In Each Group. Group A (Control Group) Was Given Warm Up And Hot Pack For 15 Minutes. Groups B And C Were Experimental Groups. Group B Was Given Mulligan Traction Straight Leg Raise Technique In Addition To Warm Up And Hot Pack. Group C Was Given Pnf Hold Relax Technique In Addition To Warm Up And Hot Pack. The Baseline Data Was Recorded On First Day (Pre Intervention) And On Last Day Of Second Week (Post Intervention). All The Interventions Were Performed Once A Day, Five Days A Week For Two Weeks.

Data Analysis- The Collected Data Will Be Analysed Using Anova And Other Statistical Tests As Appropriate (Spss Software).

Result- The Result Of Present Study Shows That Pnf Hold Relax Is More Effective In Improving Flexibility Of The Hamstring Muscle Than Mulligan Tslr.

Keywords- Flexibility, Hamstring Tightness, Mulligan Traction Straight Leg Raise, Pnf Hold-Relax, Muscle Strength.

1. Introduction

Flexibility is the capability of muscle to move a free of pain active range of motion of a single joint or series of joints easily, smoothly and unrestricted.[1]

flexibility can be static and dynamic. Various factors that affect the flexibility are:

- Joint Structure: Joint's ROM is determined.
- Muscle Imbalance: Antagonistic muscles pull the joint at different angles, an imbalance in muscle length and strength will impede flexibility.
- Muscle Control: In particular activities, a lack of strength to regulate the working muscle might impede flexibility.
- Age: As connective tissue ages, flexibility declines with age.
- Gender: Because of anatomical, hormonal, and structural variables, women are often more flexible.
- Connective Tissue: Joint capsules, tendons, ligaments, and fascia all impact flexibility. For this reason, complete connective tissue training and recovery are essential to maintain flexibility.
- Muscle Bulk: If a program for gaining muscle is not accompanied by a stretching practice, muscular hypertrophy may reduce flexibility.
- Resistance exercise: Restricting entire range during a workout can make muscle less flexible.[2]

Muscle strength is the capacity of a muscle to assist the repeated contraction for an increased period of time against resistance. Engaging in different activities make muscles work more than usual such as squats, push-ups, jumping jacks etc. help in increasing the muscular endurance or muscle strength.[3]

The standard classification scheme for tonic and phasic muscles follows Janda's evolutionary development criterion. Decrease in the ROM and the capacity of the muscle to lengthen about a joint means a loss of muscle flexibility which leads to tightness of the muscle.[4]

The various causes for hamstring tightness are poor posture, repetitive movements, sitting constantly in a sedentary lifestyle that forces hip flexors into a constantly shortened position and genetic factors that are individuals born with naturally short hamstrings when some people are naturally supple.[5]

Tight hamstrings cause a small amount of knee flexion during exercises and require rather significant quadriceps efforts to offset the hamstring's passive resistance. This can lead to pain in the knee joint that affects gait and raise the reaction forces at the patellofemoral joint. So, hamstring tightness can lead to increased patellofemoral compressive force which may further lead to patellofemoral syndrome.[6]

Tightness in the hamstring muscles might lessen lumbar lordosis because they are a vital component of the hip complex and lumbo-pelvic muscles possibly reducing the body's ability to absorb force, altering posture and range of motion of the lower limb, and raising chances of developing low back pain.[7]

Tension in the hamstring muscles is a typical ailment even in young, healthy people and recreational athletes. According to a study conducted in 2018 the prevalence of hamstring tightness is 82% in youngsters with mean age of 18-25 years.

The literature says that there is 55% prevalence of hamstring tightness among the population who have a prolonged sitting. The study concludes that with the advancement of age the chances of hamstring tightness also increase.[8]

various interventions are there that can help in improvement of hamstring tightness such as stretching, mulligan techniques, MFR etc. Stretching include various types such as PNF, static stretching and ballistic

stretching etc. [9]

Traction Mulligan Straight Leg Raise technique and Proprioceptive Neuromuscular Facilitation: hold relax technique are both useful interventions that are adapted to focus on the tightness and strength of hamstring muscle. However, studies showing comparison between these techniques are lagging. Therefore, the purpose of the current study is to compare the effects of Mulligan Traction Straight Leg Raise Technique and Proprioceptive Neuromuscular Facilitation hold relax technique on hamstring tightness and strength among young adults. [10]

2. Methodology

The purpose of the current study was to compare the effects of Mulligan Traction Straight Leg Raise technique and Proprioceptive Neuromuscular Facilitation hold relax technique on tightness and strength of hamstring muscle among young adults. 60 subjects were taken on the basis of inclusion and exclusion criteria.

2.1 INCLUSION CRITERIA:

- AGE: 18 - 25 years.
- Subjects from both gender were included.
- Subjects with hamstring muscle tightness (as evaluated by active knee extension test).

2.2 EXCLUSION CRITERIA:

- Subjects having history of trauma to low back, pelvis and/or lower limb.
- Subjects having deformity of spine and/or lower limbs (including hyper-pronating foot)
- Subjects having inflammatory condition that could affect motion of lumbar spine and/or lower limbs.
- Subjects with history of neurological disorder(s) affecting lower extremity(polyneuropathy).
- Persons engaged in any sports activity.

2.3. Procedure

The subjects were divided into 3 group A, B and C. The baseline data was recorded on first day (pre intervention) and on last day of second week (post intervention). Total 10 sessions per subject were given over 2 weeks i.e. 5 sessions per week. The tightness of hamstring muscle was evaluated by AKE test respectively.

- Active knee extension (AKE) test: The subjects were asked to lie in supine position with leg being tested is in 90 degree in flexion. The subjects were asked to extend the leg until they feel a powerful opposition while keeping their foot relaxed and to hold the position for about 5 seconds.[11] With the help of universal goniometer ROM was noted. The average of three repetitions was calculated with a minute relaxation period between two consecutive repetitions.

The subjects of group A were given Hot pack and warm up. In group B along with warm up and hot pack, PNF hold relax was included. Whereas in Group c instead of PNF, Mulligan traction straight leg raise was applied.

3. RESULT

Data analysis was performed using SPSS 18. Paired t test was used to compare the variables of three groups. The level of significance selected for the study was $p< 0.05$. For the sake of clear understanding, the results are explained under the following headings:

- 3.1: Analysis of Active Knee Extension Test (AKE)
- (3.1) a: Intra group analysis of AKE test for group A

- (3.1) b: Intra group analysis of AKE test for group B
- (3.1) c: Intra group analysis of AKE test for group C
- 3.2 Analysis of strength of Hamstring muscle
- (3.2) a: Intra group analysis of strength of hamstring muscle of group A
- (3.2) b: Intra group analysis of strength of hamstring muscle of group B
- (3.2) c: Intra group analysis of strength of hamstring muscle of group C
- 3.3. Inter group analysis
- (3.3) a: Inter group analysis of AKE between the groups A, B and C
- (3.3) b: Inter group analysis of strength between the groups A, B and C

Repeated measure ANOVA was done for intra group analysis.

- One way ANOVA and Post Hoc analysis by Tukey's was done for inter group analysis.
- Inter group analysis for AKE test on the day 0 and 10th day was done using Post Hoc analysis by Tukey's.

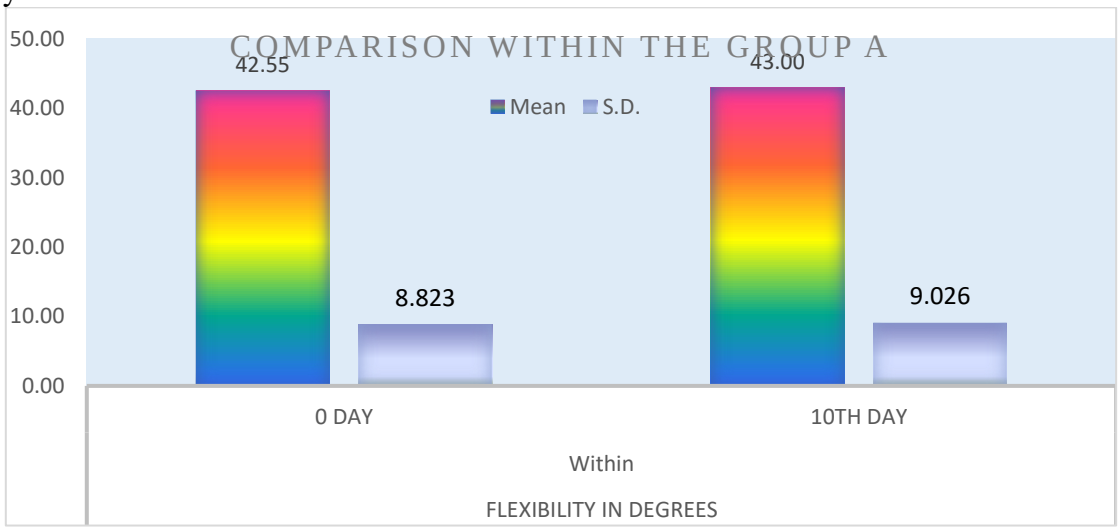

Fig. 3.1(a): graphical representation of Analysis of AKE for group A.

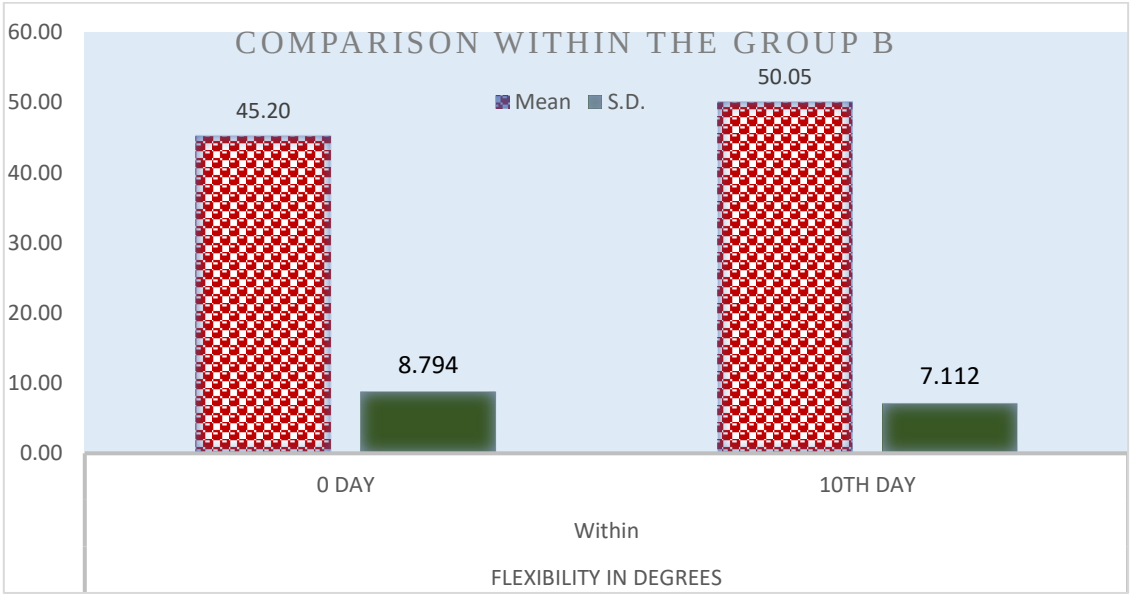

Fig. 3.1(b): graphical representation of Analysis of AKE for group B.

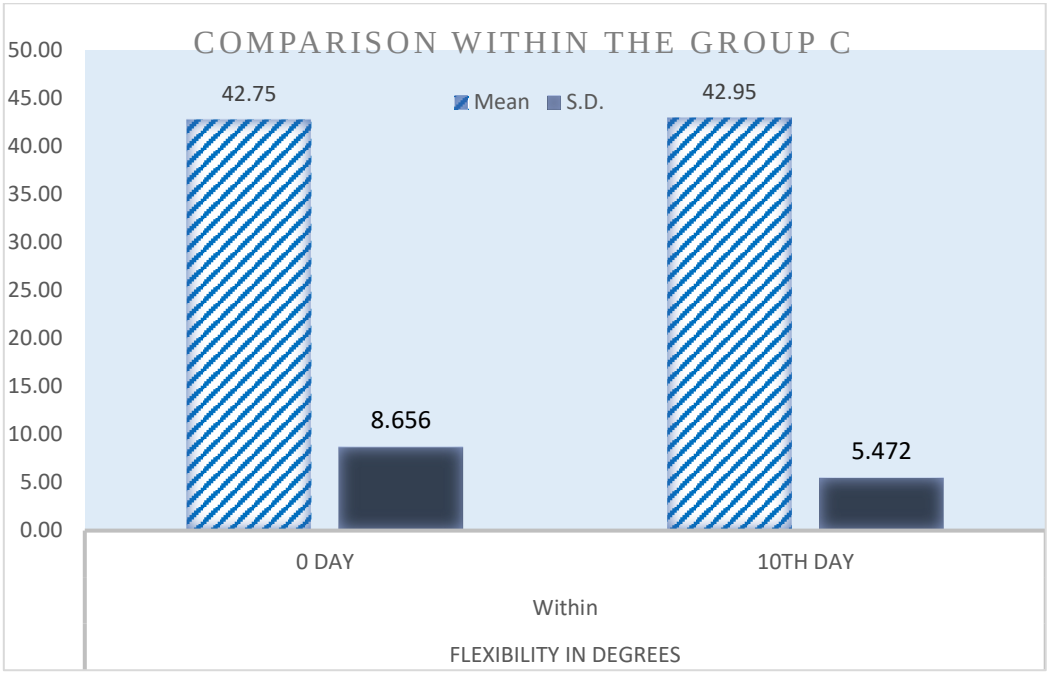

Fig. 3.1(c): graphical Analysis of AKE for group C

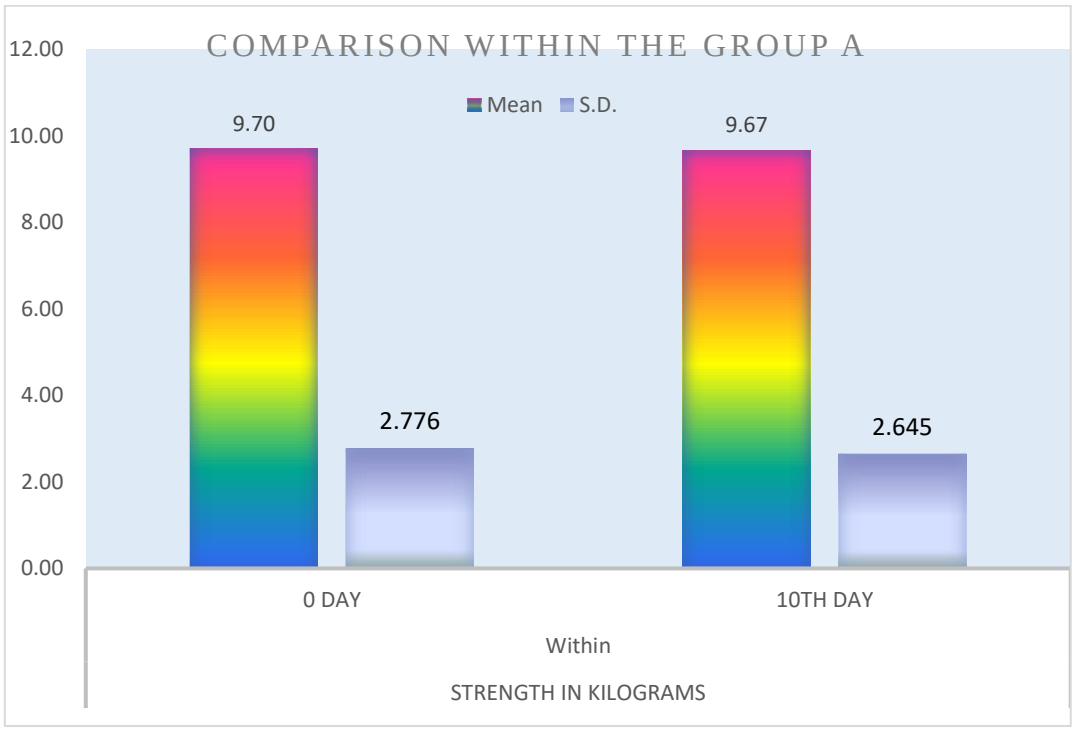

Fig. 3.2(a): graphical representation of strength of hamstring muscle for group A.

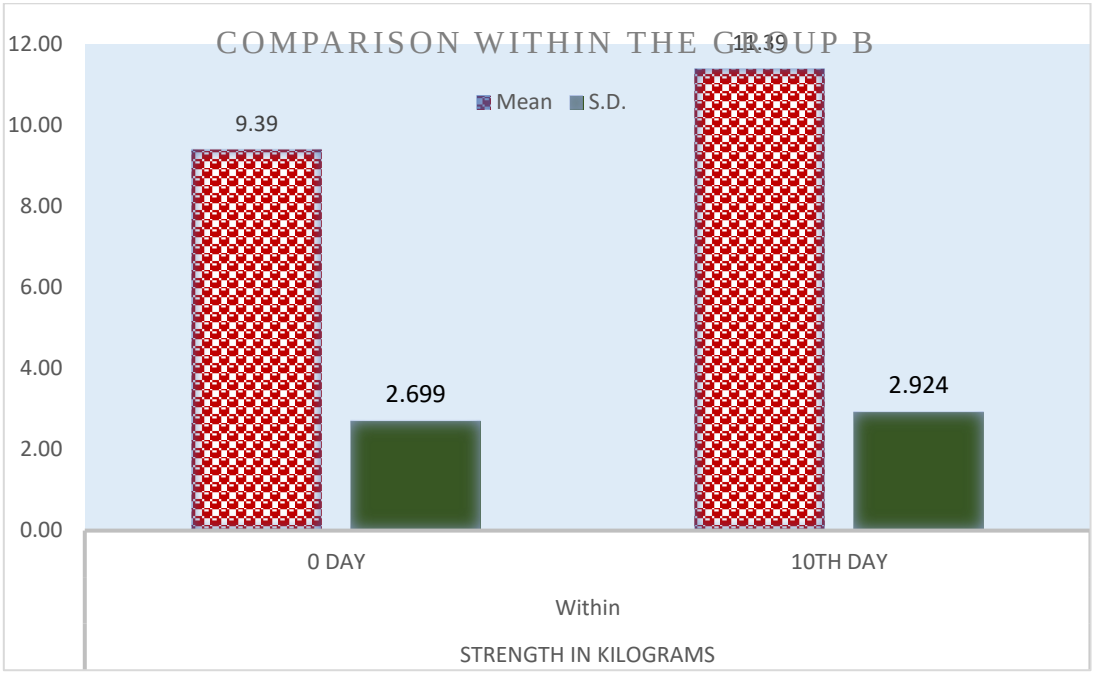

Fig. 3.2(b): graphical representation of strength of hamstring muscle for group B.

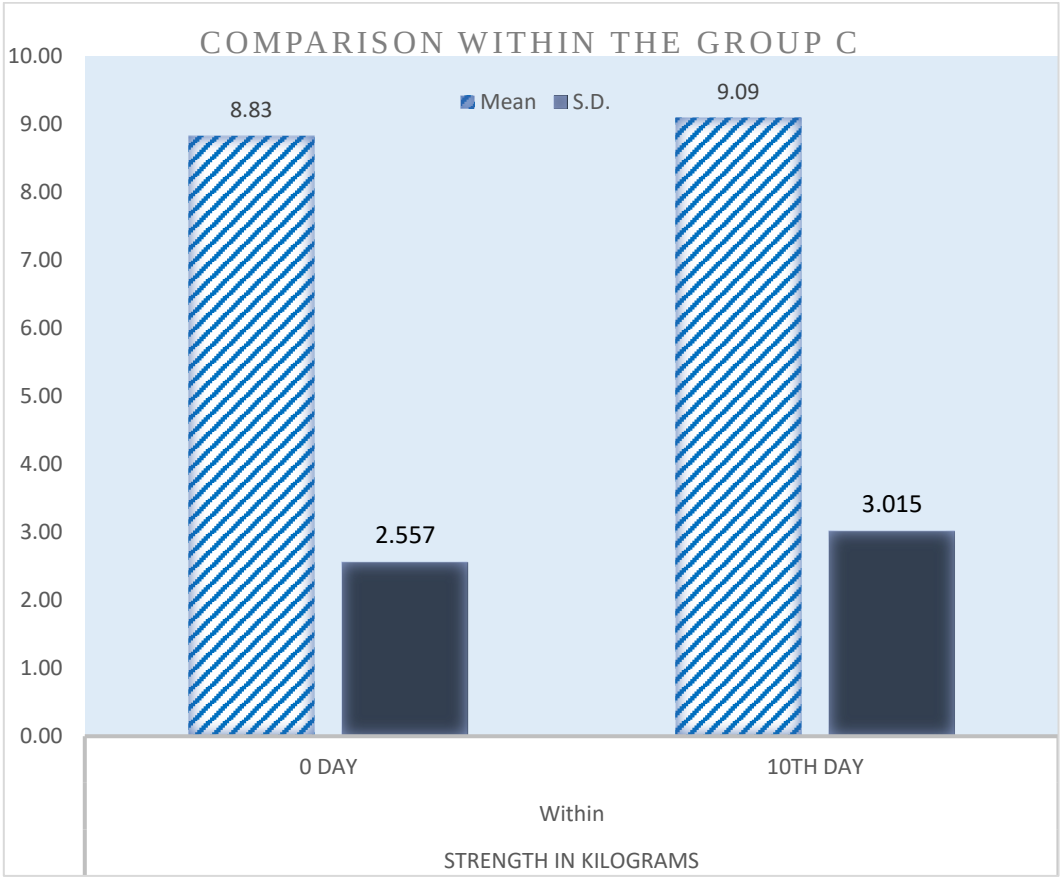

Fig. 3.2(c): graphical representation of strength of hamstring muscle for group C.

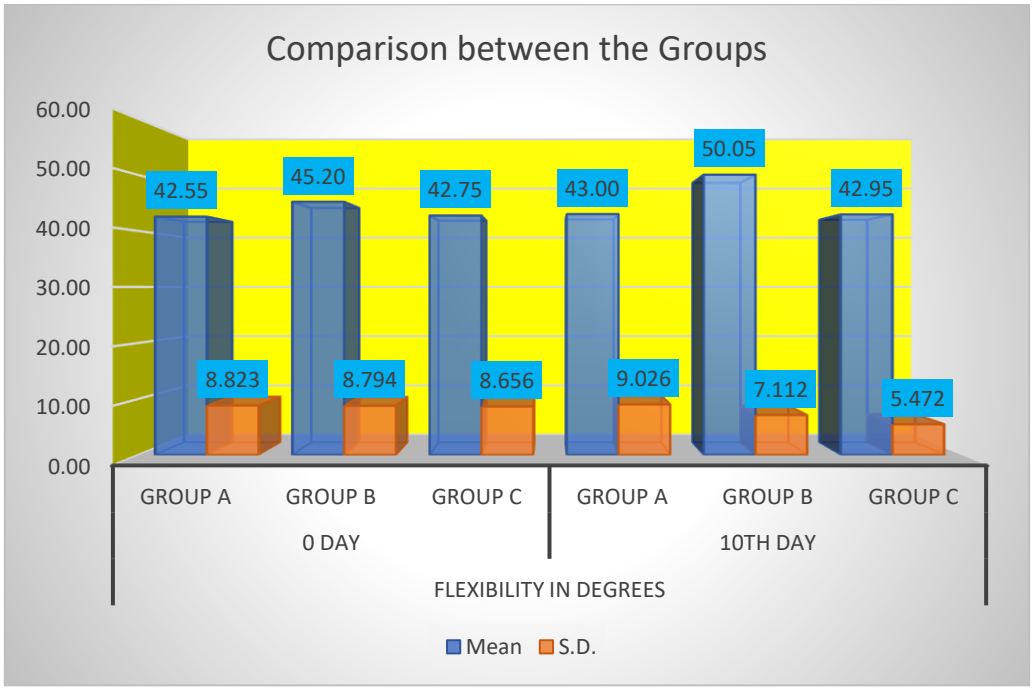

Fig.3.3(a): graphical representation of Analysis of AKE between groups A, B and C.

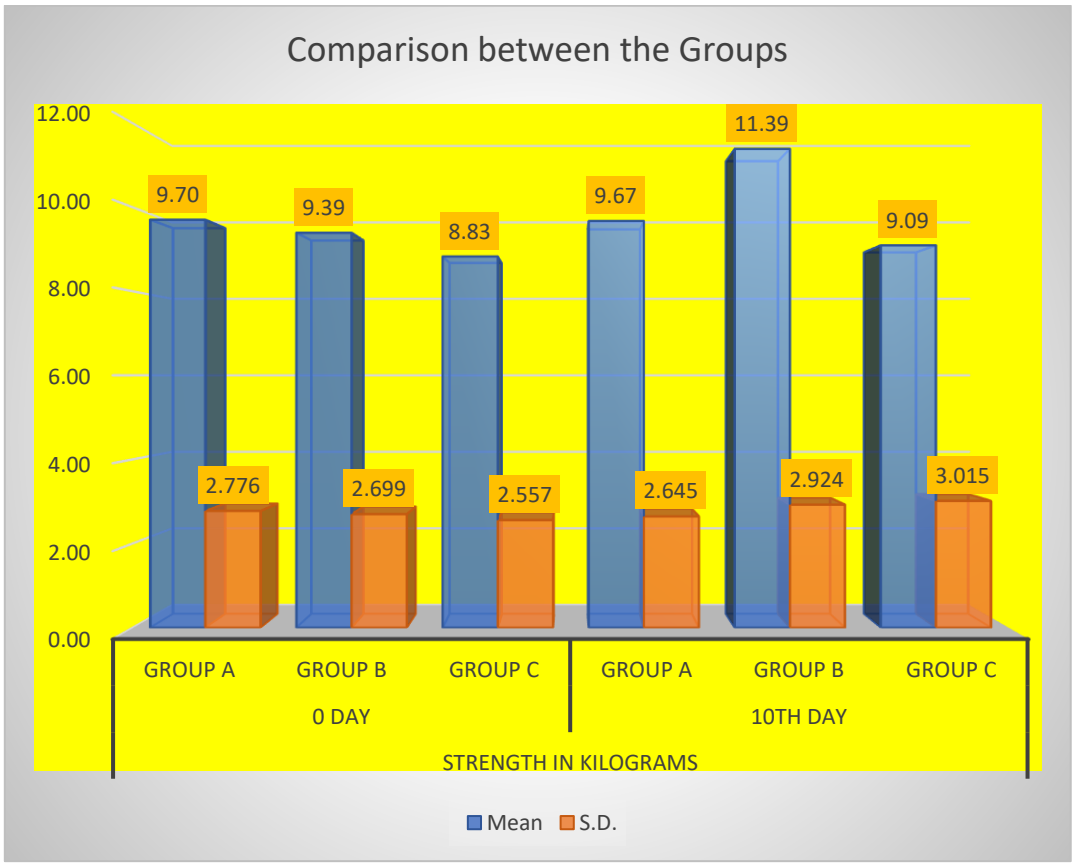

Fig.3.3(b): graphical representation of Analysis of strength of hamstring muscle between groups A, B and C.

4. DISCUSSION

Flexibility is an essential element of a physical conditioning regimen, which enables the tissue to absorb stress, absorb shock waves, and increase movement efficiency, all of which reduce or eliminate the injury.[13]

A similar study by Koli BK and Anap DB[10] on the prevalence and severity of hamstring tightness among college students found that 68% of students reported having hamstring tightness.[4]

In present study, we compared the effects of PNF hold relax and Mulligan TSLR for hamstring tightness and flexibility in young adults. There were total 60 subjects included in the research and were sectioned into groups A, B and C. Each group consisted of 20 subjects. The subjects of group A performed warm up (brisk jogging for 5 mins and hot pack for 10 mins). The participants of group B were given treatment with PNF (hold relax) and 15 minutes of warm up. Mulligan TSLR and warm up of fifteen minutes was given to the subjects of group C. Data was recorded on 0 day and 10th day. Data was analysed using SPSS software version 18.0. The intra group analysis of group B and C for AKE showed F value=6.180 (p=0.004) and value of strength was F value=3.460 (p=0.038). This result shows that PNF hold relax and Mulligan TSLR are both effective techniques for treating hamstring tightness. However, the result of inter group analysis of group B for AKE showed a significant difference with t= 5.64 5(p<0.000) and values of strength were found to be t=4.473 (p<0.000). This manifests that PNF hold relax was more effective in improving the flexibility and strength of hamstring muscle.

In addition to the traditional underlying mechanisms, recent literature suggests that decrease in the response amplitude of the H reflex and muscle stretch reflexes following contraction of a stretched muscle may be the outcome of presynaptic hinderance of the spindle of the muscle sensory signal. These findings have led to the utilization of PNF stretching as an alternative active stretching technique by both clinicians and researchers. According to Macefield et al., the hold-relax approach activates Golgi tendon organ tension receptors within the hamstring muscle-tendon unit, and autogenic inhibition inhibits the hamstring muscle.[4]

A study by O' Hora J showed that when PNF was utilized as a one-time maneuver in the review and it significantly increased the passive extension of the knee in contrast to the control group. Compared to static stretching, the PNF approach develop a noticeably higher standard rise in the passive extension of knee of 4.27°. In comparison to control group, proprioceptive neuromuscular facilitation (PNF) stretching enhanced motion, and PNF enlarged the movement in contrast to static stretching.[14]

Flexible stretching is achieved by relaxing the muscles' contractile component through modified hold-relax stretching. It has been suggested that improving hamstring flexibility is a useful strategy for enhancing hamstring muscle function. PNF hold-relax was also described to be useful in increasing hamstring's extent of movement by Gribble et al. By Lim et al, it has been proved that PNF stretching technique helps to improve hamstring muscular extensibility. Advantages of autogenic inhibition could be a factor in the enhancement of hamstring range of motion. Ability of the Golgi tendon organs to detect variations in tension as well as length is necessary for autogenic inhibition. Static and PNF hamstring stretching procedures both cause tension in the antagonists. Therefore, whether an active or passive stretch was used for the measurement methodology or if a static or hold-relax stretch was used for the training approach, it would not have an impact on the presence of autogenic inhibition. The improvement of stretch tolerance is another potential mechanism for the range of motion expansion. H albertsma et al.'s study, which showed an increase in hamstring flexibility, lends support to this. A study by Kompal R. concluded that to find the most effective way to examine the efficacy of PNF hold-relax in increasing hamstring flex-

ibility, more research comparing active and passive knee extension measurements may be helpful.[15]
Marvin C. conducted a study to know the effects of PNF hold relax procedure on increasing the muscle length in which the PNF hold-relax group's significant range increases may be attributed to autogenic inhibition and active connective tissue mobilization. According to Kabat, a maximal isometric contraction of a shortened muscle in a slightly stretched position, as in the PNF hold-relax method, can cause the muscle to relax. It is thought that when a muscle is stretched to its maximum length, the GTOs become activated and send impulses to a spinal cord interneuron that inhibits the muscle's alpha motor neuron. The muscle relaxes abruptly as a result of these impulses overriding those from the muscular spindle. Study by Marvin C. determines that the PNF hold-relax technique is a far more successful way to expand the shortened tissue's range of motion. Using the PNF hold-relax technique leads to faster and larger range gains. The PNF hold relax technique is recommended because there is less chance of injury to the muscle and the connective tissue that supports it, and because the patient is actively involved in his therapy, which is better for him psychologically. This approach avoids movement-related pain by using an isometric contraction. It also increases muscle strength when range of motion is increased. The PNF hold-relax technique yields better outcomes in a shorter amount of time if time is an issue.[16]

6. CONCLUSION

From the result of present study, it is proved that PNF hold relax is effective in improving flexibility of the hamstring than Mulligan TSLR. Thus, the study came to conclusion that PNF is useful as an intervention for treating muscle tightness. Therefore, the result from present study can be taken into consideration while treating patients with hamstring tightness. Thus, this study supports alternative hypothesis.

7. Limitations Of the Study

1. The sample size for the study was small
2. Long term follow-ups of the subjects have not been done
3. Environmental & work-related factors that may have predisposed to hamstring tightness were not controlled.
4. The study was defined to limited population
5. Study was limited to less intervention sessions.

8. Scope For Future Studies

1. The study can be done on large sample with incorporating various cities.
2. The study can be done by incorporating treatment to both sides.
3. The study can be replicated for the other muscle groups
4. The study can be conducted on different population like sports persons.
5. The study can be performed with other techniques for better results.
6. Other objective assessment tools can be added.

9. References

1. Kisner C, Colby LA. Therapeutic Exercise: Foundations and Techniques. Philadelphia: F.A. Davis, 2012; edit 6th, 73
2. https://www.sportsmedtoday.com/flexibility-va-247.htm

3. https://www.healthline.com/health/exercise-fitness/muscular-strength
4. Koli BK, Anap DB. Prevalence and severity of hamstring tightness among college student: A cross sectional study. International Journal of Clinical and Biomedical Research. 2018 Apr 15:65-8.
5. Jignahsa P, Madhavi S. To find out prevalence of hamstring tightness on young adult population. Journal of emerging technologies and innovative research. 2014
6. JABBAR M, MUSTANSAR A, ZULFIQAR F, AYUB T, LATIF W, LAIQUE T. Prevalence Of Hamstring Tightness Due To Prolonged Sitting Among Administrative Staff: Cross Sectional Study.
7. SAREEN A, PRAKASH J. Prevalence of Hamstring Tightness in Young Orthopaedic Surgeons. Journal of Clinical & Diagnostic Research. 2021 Jun 1; 15(6).
8. Bandy WD, Irion JM, Briggler M. The effect of time and frequency of static stretching on flexibility of the hamstring muscles. Physical therapy. 1997 Oct 1; 77(10): 1090-6.
9. Nelson RT, Bandy WD. Eccentric training and static stretching improve hamstring flexibility of high school males. Journal of athletic training. 2004 Jul;39(3):254.
10. Razzaq M, Bhatti ZM, Nawaz U, Ghani HM. Comparative Effects of Mulligan's Two Leg Rotation Technique and Muscle Energy Technique on Hamstring Flexibility. Pakistan Journal of Medical & Health Sciences. 2022 May 26;16(05):102-.
11. An HJ, Choi WS, Choi JH, Kim NJ, Min KO. Effects of muscle activity and number of resistance exercise repetitions on perceived exertion in tonic and phasic muscle of young Korean adults. Journal of Physical Therapy Science. 2015; 27(11): 3455-9
12. Ahmed H, Iqbal A, Anwer S, Alghadir A. Effect of modified hold-relax stretching and static stretching on hamstring muscle flexibility. Journal of physical therapy science. 2015; 27(2): 535-8.
13. Yıldırım MS, Ozyurek S, Tosun OÇ, Uzer S, Gelecek N. Comparison of effects of static, proprioceptive neuromuscular facilitation and Mulligan stretching on hip flexion range of motion: a randomized controlled trial. Biology of sport. 2016 Mar;33(1):89-94.
14. O'Hora J, Cartwright A, Wade CD, Hough AD, Shum GL. Efficacy of static stretching and proprioceptive neuromuscular facilitation stretch on hamstrings length after a single session. The Journal of Strength & Conditioning Research. 2011 Jun 1; 25(6): 1586-91.
15. Kompal R, Ul-Islam S, Bhatti U, Tahir K, Noor R, Kashif M. Effects of static stretch versus hold relax in improving flexibility of tight hamstrings. Rehman Journal of Health Sciences. 2022 Jun 30; 4(1): 36-40.
16. Tanigawa MC. Comparison of the hold-relax procedure and passive mobilization on increasing muscle length. Physical therapy. 1972 Jul 1; 52(7): 725-35.