A Study on Effectiveness of Myofascial Release, Sub Occipital Muscle Inhibition Technique & Static Stretching on Hamstring Flexibility among it Workers with Hamstring Tightness

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Abstract

Background: Flexibility is the ability to move a single joint or a group of joints efficiently over a painless, unrestricted Range of Motion (ROM). Reduced flexibility may result in a diminished range of motion, which in turn alters the biomechanics and, as a result, the joints. Maintaining a prolonged forward bend sitting position causes strain on the hamstrings, which leads to decreased flexibility. **Objectives:** To examine the combined impact of static stretching, the suboccipital muscle inhibition technique (SMI), and the myofascial release technique (MFR) on hamstring flexibility, as measured by an active knee extension test, both before and after the intervention. **Methodology:** The 45 participants were divided into three groups according to the selection criteria. Myofascial release method was given to the 15 people in group A, while Sub occipital inhibition technique was administered to the 15 people in group B. And Group C was given Static stretching and had 15 participants. For four weeks, all of the groups underwent the interventions five times a week. **Results**: Active knee extension test was used to measure hamstring flexibility during the pre- and post-tests. For AKE(R), the pre-mean values of groups A, B, and C were 120.07, 120.65, and 119.43, respectively. The pre-mean value of group A, B, and C for AKE (L), where 119.27, 119.2, and 119.8, and AKE(R), where 140.47, 147.53, and 132.93, are the Post mean values for groups A, B, and C. The Post mean group A, B, and C for AKE (L) have values of 139.6, 146.4, and 131.73, respectively. **Conclusion**: In summary, the research found that the Sub occipital muscle inhibition method was more successful in increasing hamstring flexibility in IT workers who had hamstring tightness.

Keywords: Myofascial release technique, Sub-occipital muscle inhibition, Static stretching, Hamstring flexibility, Superficial back line, and Active knee extension test

Introduction

Flexibility refers to the ability to move one or more joints freely, without any limitations, and with a range of motion free of pain. [1]It is the most important element necessary for most musculoskeletal functions and for maximizing the effectiveness of physical activities[2].

The three major muscles that make up the hamstrings are the semitendinosus, semimembranosus, and biceps femoris, which originate from the ischial tuberosity and insert into the fibula and tibia. As a result, they function as hip joint extensors and knee joint flexors [3].

Four muscles make up the suboccipital muscles, which connect the spinous or transverse processes to the C1 or C2 vertebrae. The base of the occiput is the point where all of these muscles, including the obliquus capitis inferior, are connected. The sub occipital muscle is responsible for tilting and rocking the head into extension as well as for protracting the head. The head is rotated to the same side with the help of the rectus capitus posterior major and obliquus capitus inferior. These muscles are vital for maintaining the head on the atlas and the atlas on the axis, as well as for fine motor control [4].

Specifically, both athletes and ordinary people regularly experience flexibility dysfunction in the hamstring muscle group [5, 6]. Insufficient or Low levels of physical activity or inadequate treatment following a chronic muscle ailment can lead to muscle stiffness. On the joint that the muscle acts on, particularly on a muscle, the tightness of the muscle may result in overuse syndrome or certain pathological disorders. Similar to the hamstring, which spans two joints [7, 8].

Because of limited movement, musculoskeletal issues, and hamstring tightness, the spine disc may degenerate, joints may hypo mobile, or nerves may be compressed, all of which can contribute to lower back discomfort. [9, 10]

A reduction in hamstring flexibility may result from sitting for extended periods of time [11]. The length-tension relationship of a muscle and the limb's ability to absorb impact are both influenced by muscular tension. Reduced flexibility leads to a vicious circle of range reduction and postural problems, which in the end impairs optimum performance [12].

In addition to limiting one's range of motion [13], tight hamstrings can also cause a number of other musculoskeletal problems. The knee cannot be extended when the hip is bent due to the shortness of the hamstring muscles, and hip flexion cannot be performed when the knee is extended. Due to modifications in posture in the pelvic region that result in flat back and posterior pelvic tilt. [14, 15] Due to hamstring stiffness, the ranges of active knee extension (AKE) and dorsiflexion are reduced, as is the lumbar lordosis, resulting in postural abnormalities, a bending forward deficit, and a reduction in the ability to perform active knee extension (AKE). Hamstring strains or injuries, pain when sitting, and an awkward gait [16]. The lumbopelvic rhythm is also affected by hamstring tightness[17]. Patellar tendinopathy, patellofemoral pain syndrome, tight hamstrings are associated with plantar fasciitis[18, 19].

The chain of connected systems that produce human movement is known as the kinetic chain. As a result, muscle and fascia are functionally connected. Superficial back line links the sub occipital muscles with the hamstrings. The forehead and the base of the foot are connected by a continuous layer of fascia known as the superficial back line. Several structures contribute to supporting this fascia along the way, including the plantar fascia, Achilles tendon, soleus, two heads of the gastrocnemius, hamstrings, sacrotuberous ligament, the frontalis, suboccipital muscle, transversospinalis, erector spinae, and sacral fascia. The superficial back line, which includes the suboccipital and hamstring muscles, may benefit the whole line [20].

By reducing the myofascial constraint in the suboccipital area, the manual sub occipital muscle inhibition approach attempts to relieve the tension in the sub occipital muscles. The goal of the suboccipital muscle inhibition (SMI) technique is to relieve the tension in the four muscles that sit between the axis and the occiput, which are collectively referred to as the suboccipital muscles. Regulates the upper cervical vertebrae (rectus capitus posterior major, rectus capitus posterior minor, obliquus capitus inferior, and obliquus capitus superior); these muscles are known to be linked to controlling both head rotation and body posture [21, 22].

One of the most often used manual methods for improving the extensibility of soft tissue through compression by restoring constricted fascia or myofascial release (MFR). Normal muscular strength [23]. It was hypothesized that the MFR method might have a role in treating pain, increasing flexibility, reducing impairment, and ultimately improving function in people with everyday duties. [24, 25, 26, 27]. This method uses precisely directed mechanical forces with low load and extended duration to manipulate the myofascial complex. [28].

The gold standard for determining flexibility is static stretching, which involves stretching a muscle to its limit and holding the position for a period of time. A popular method for increasing hamstring flexibility is static stretching. [24, 41, 42, 43].

Need for the study

Myofascial release, positional release, muscle energy, and a variety of stretching methods are just some of the therapeutic strategies used to treat hamstring tightness. The sub-occipital muscle inhibition method is widely acknowledged to be beneficial in the treatment of patients with upper cervical spine problems, but its connection to other structures is not yet understood.

Considering the recent improvements in flexibility, myofascial release methods, and soft tissue mobilization are being investigated for immediate effects on hamstring flexibility, but there is a dearth of research on the effects of long-term and combined intervention methods [29].

As a result, the study's goal is to determine how the myofascial release and sub-occipital inhibition methods affect hamstring flexibility in IT professionals with hamstring tightness.

Methodology

The purpose of this pre-test and post-test experimental study, which lasted six months at the Out Department of KG College of Physiotherapy, Coimbatore, was to determine the effects of myofascial release, the suboccipital muscle inhibition technique, and static stretching on hamstring flexibility in IT professionals with hamstring tightness. Forty-five male participants 25–35 years old, clinically diagnosed with bilateral hamstring tightness and meeting the inclusion criteria, who had SRTs of 16.9 cm or less and Active knee extensions of 125° or less, were chosen and randomly allocated into three groups of fifteen participants each. Participants with A history of neck injuries, tumors, infections, cervical spine fractures, herniated or protruded discs, spinal deformities, severe back pain, and muscle tendon injuries of the neck, back, and lower limbs. The history of any recent surgeries to the affected side, the hamstring, hypermobility (Beighton score> 4), and involvement in a regular flexibility/ yoga regimen were all excluded. Using the Active knee extension test, baseline evaluations were conducted, and demographic information such age, height, weight, sitting hours, and years of experience were gathered. Group A received the Myofascial release technique, Group B received the Sub occipital muscle inhibition technique, and Group C received Static Stretching, all of which lasted for thirty minutes, five sessions each week for four weeks. Every participant was given written permission, told to let the researcher know if they experienced any pain throughout the procedure, and educated about the study. After the intervention, the assessments were conducted again using the same methods. The same outcome metrics were used, and statistical analysis was done to compare the efficacy of the three treatments on hamstring flexibility.

Data analysis & results

Within Group analysis of Group A, B & C were done by Paired T test and between group analyses were done by one way ANOVA and Bonferroni Post HOC test. The statistical analysis where done by using SPSS Version 20.

The present study evaluated and compared the effects of Myofascial release technique and Sub occipital muscle inhibition technique on hamstring flexibility in IT workers with hamstring tightness using the Active knee extension test.

AKE	Group	Test	Mean	SD	T Value	P Value
AKE (R)	Group A	Pre	120.0667	3.28344	-38.293	.000
		Post	140.4667	3.97971		
	Group B	Pre	120.6482	3.30944	-41.566	0.00
		Post	147.5333	3.71996		
	Group C	Pre	119.4326	3.01109	-29.580	0.000
		Post	132.9333	3.01109		
AKE (L)	Group A	Pre	119.2667	2.37447	-37.624	.000
		Post	139.6000	3.13506		
	Group B	Pre	119.2000	3.44757	-57.865	0.00
		Post	146.4000	3.39748		

	Group C	**Pre**	119.8000	2.59670	-18.135	0.000
		Post	131.7333	2.49189		

Table 1: Within group analysis of Pretest and posttest values of Active Knee extension test (Right) & (Left) for Group A, B, & C

In Group A, for AKE(R) mean pre-test score was 120.0667, which improved to 140.4667 post-treatment, the paired t-test yielded value of the -38.293, which was statistically significant of the value ($p < 0.05$) as mentioned the Table 1.

In Group A, for AKE (L) mean pre-test score was 119.2667, which improved to 139.6 post-treatment, the paired t-test yielded value of the -37.624, which was statistically significant of the value ($p < 0.05$) as mentioned the Table 1.

In Group B, for AKE (R) mean pre-test score was 120.6482, which improved to 147.5333 post-treatment, the paired t-test yielded value of the -41.566, which was statistically significant of the value ($p < 0.05$) as mentioned the Table 1.

In Group B, for AKE (L) mean pre-test score was 119.2, which improved to 146.4 post-treatment, the paired t-test yielded value of the -57.865, which was statistically significant of the value ($p < 0.05$) as mentioned the Table 1.

In Group C, for AKE (R) mean pre-test score was 119.4326, which improved to 132.9333 post-treatment, the paired t-test yielded value of the -29.580, which was statistically significant of the value ($p < 0.05$) as mentioned the Table 1.

In Group C, for AKE (L) mean pre-test score was 119.8000, which improved to 131.7333 post-treatment, the paired t-test yielded value of the -18.135, which was statistically significant of the value ($p < 0.05$) as mentioned the Table 1.

		SUM OF SQUARES	DF	MEAN SQUARE	F	SIG
AKE(R) PRE	Within Groups	3.600	2	1.800	.175	.840
	Between Groups	431.200	42	10.267		
	Total	434.800	44			
AKE (R) POST	Within Groups	1599.244	2	799.62	61.918	.000
	Between Groups	542.400	42	12.914		
	Total	2141.644	44			

Table 2: Between group analysis of Pretest and posttest values of Active Knee extension test (Right) for Group A, B, & C

		Sum Of Squares	DF	Mean Square	F	SIG
AKE(L) PRE	Within Groups	3.244	2	1.622	.201	.819
	Between Groups	339.733	42	8.089		
	Total	342.978	44			
AKE (L) POST	Within Groups	1616.178	2	808.089	87.896	.00
	Between Groups	386.133	42	9.194		
	Total	2002.311	44			

Table 3: Between group analysis of Pretest and posttest values of Active Knee extension test (Left) for Group A, B, & C

Dependent Varible	**(I) Groups**	**(J) Groups**	**Mean Difference**	**Std Error**	**SIG**
AKE (R) PRE	Group A	Group B	-.60000	1.1700	1.000
		Group C	.00000	1.1700	1.000
	Group B	Group A	.60000	1.1700	1.000
		Group C	.60000	1.1700	1.000
	Group C	Group A	-.00000	1.1700	1.000
		Group B	-.60000	1.1700	1.000
AKE (R) Post	Group A	Group B	-7.06667	1.31221	.000
		Group C	7.53333	1.31221	.031
	Group B	Group A	7.06667	1.31221	.031
		Group C	14.6000	1.31221	.031
	Group C	Group A	-7.53333	1.31221	.000
		Group B	-14.6000	1.31221	.000

Table 4: Between group analysis of Pretest and posttest values of Active Knee extension test (Right) for Group A, B, & C by using Bonferroni Post HOC test

The table 4 shows the between group analysis of active knee extension test right which was analyzed by Bonferroni post hoc test.

There was a significant changes found in AKE (Right) range after intervention in all the 3 groups

While comparing Group A with group B and group C, group B showed statistically highly significant with p value 0.000 ($p<0.05$) and group C showed comparatively less significant with p value 0.031 ($p<0.05$).

While comparing Group B with group A and group C, both group A and group C showed comparatively less significant with p value 0.031 respectively (p<0.05).

While comparing Group C with group A and group B, group A showed comparatively less significant with p value 0.031 (p<0.05) and group B showed statistically highly significant with p value 0.000 (p<0.05).

Dependent Varible	(I) Groups	(J) Groups	Mean Difference	Std Error	SIG
	Group A	Group B	-.60000	1.17000	1.000
		GROUP C	.00000	1.17000	1.000
	Group B	Group A	.60000	1.17000	1.000
		GROUP C	.60000	1.17000	1.000
	Group C	Group A	.00000	1.17000	1.000
		GROUP B	-.60000	1.17000	1.000
AKE (L) POST	Group A	Group B	-7.06667	1.31221	.000
		GROUP C	7.53333	1.31221	.031
	Group B	Group A	7.06667	1.31221	.031
		GROUP C	14.60000	1.31221	.031
	Group C	Group A	-7.53333	1.31221	.031
		GROUP B	-14.6000	1.31221	.000

Table 5: Between group analysis of Pretest and posttest values of Active Knee extension test (Left) for Group A, B, & C by using Bonferroni Post HOC test

The table 5 shows the between group analysis of active knee extension test left which was analyzed by Bonferroni post hoc test.

There was a significant changes found in AKE (Left) range after intervention in all the 3 groups.

While comparing Group A with group B and group C, group B showed statistically highly significant with p value 0.000 (p<0.05) and group C showed comparatively less significant with p value 0.031 (p<0.05).

While comparing Group B with group A and group C, both group A and group C showed comparatively less significant with p value 0.031 respectively (p<0.05).

While comparing Group C with group A and group B, group A showed comparatively less significant with p value 0.031 (p<0.05) and group B showed statistically highly significant with p value 0.000 (p<0.05).

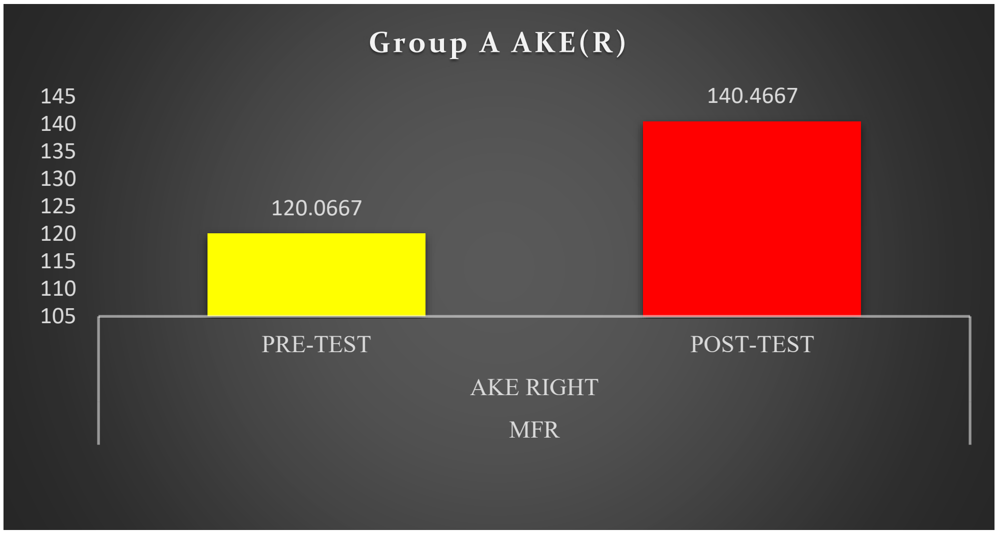

Figure 1: Pretest and posttest values of Active Knee extension test (Right) for Group A

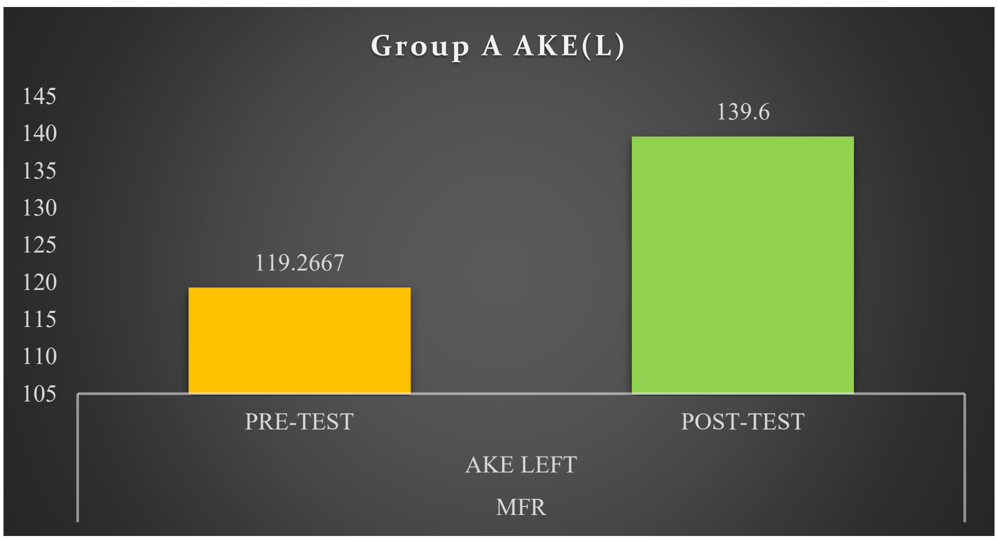

Figure 2: Pretest and posttest values of Active Knee extension test (Left) for Group A

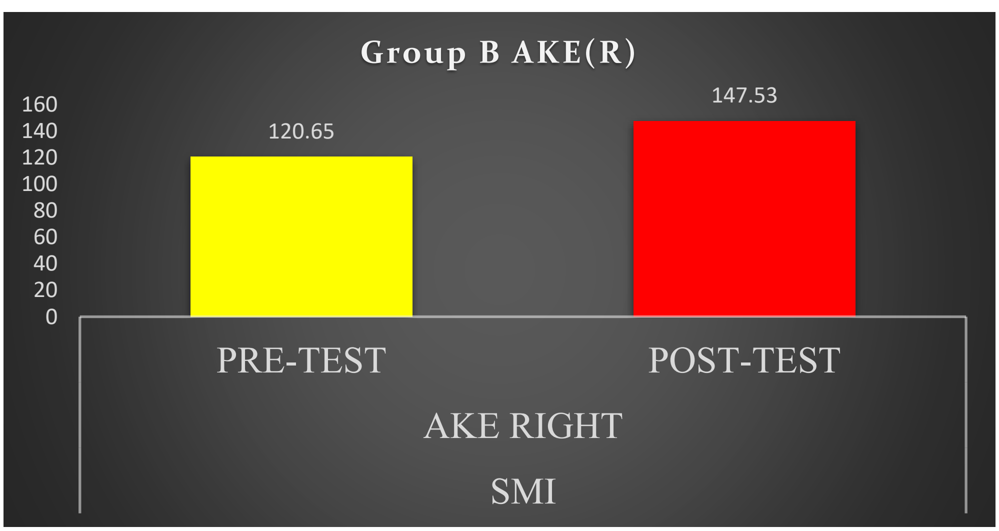

Figure 3: Pretest and posttest values of Active Knee extension test (Left) for Group B

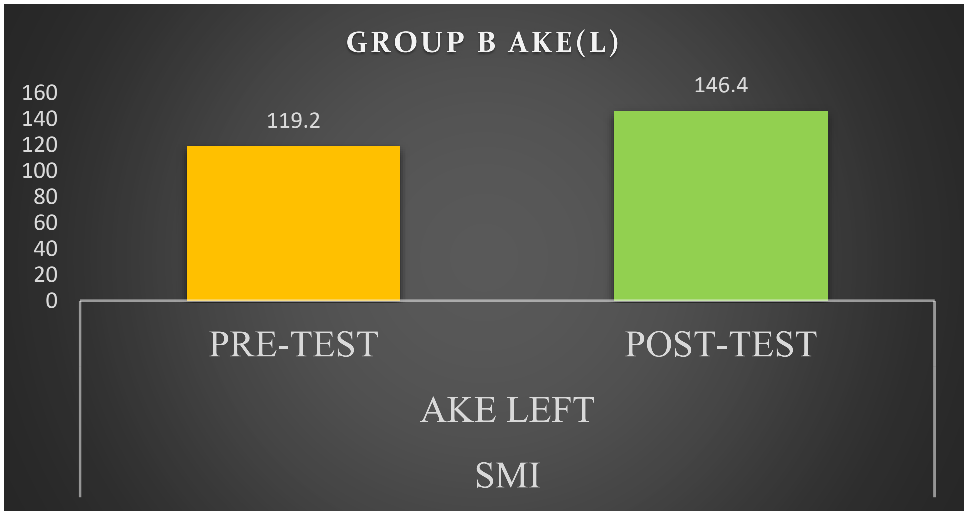

Figure 4: Pretest and posttest values of Active Knee extension test (Left) for Group B

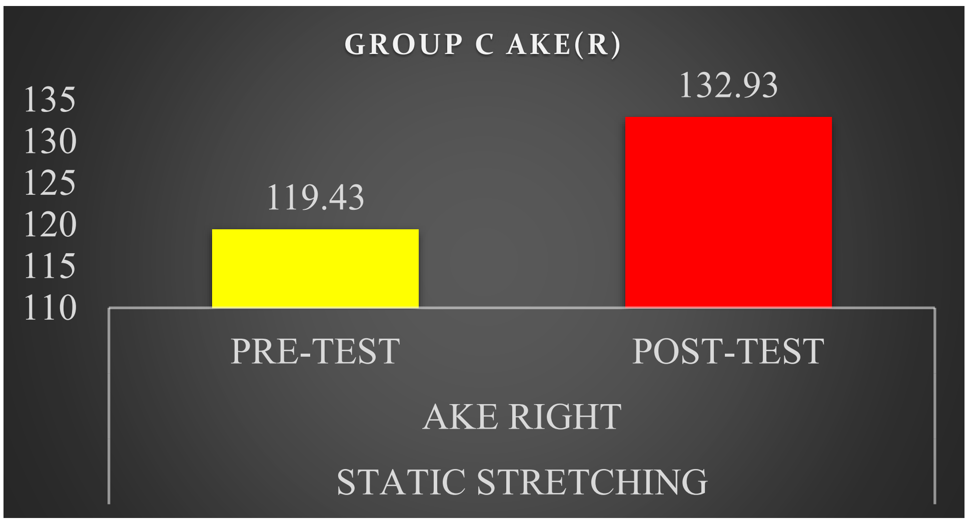

Figure 5: Pretest and posttest values of Active Knee extension test (Right) for Group C

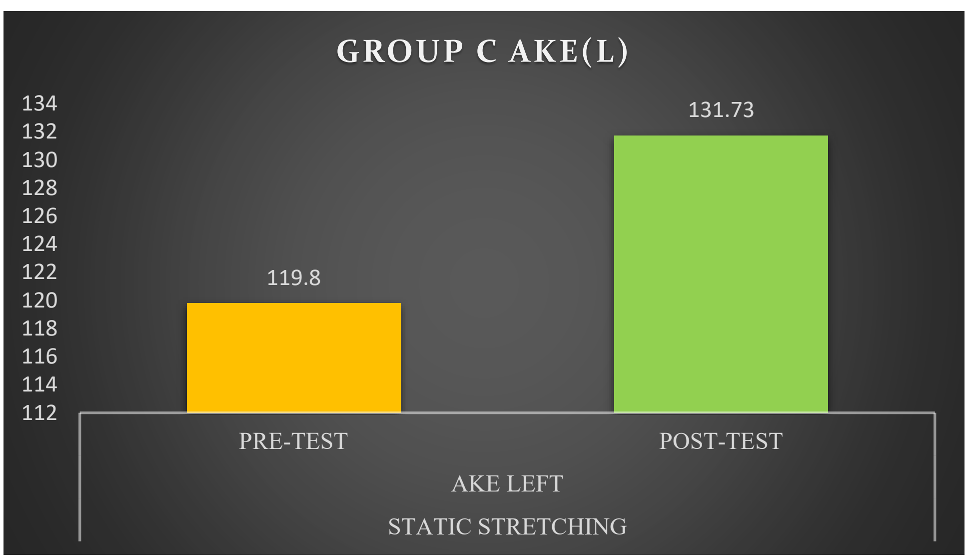

Figure 6: Pretest and posttest values of Active Knee extension test (Left) for Group C

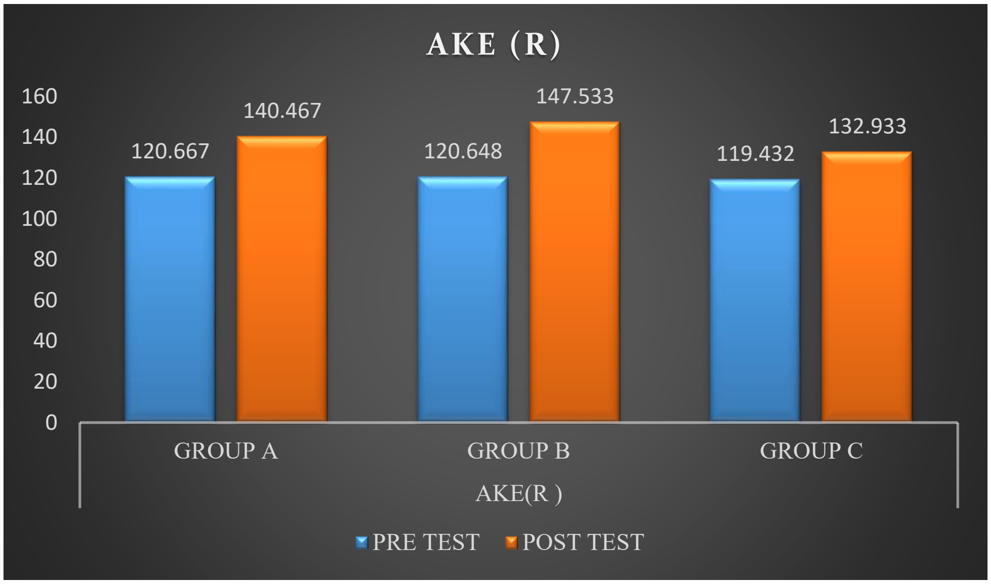

Figure 7: Pretest and posttest values of Active Knee extension test (Right) for Group A, Group B & Group C

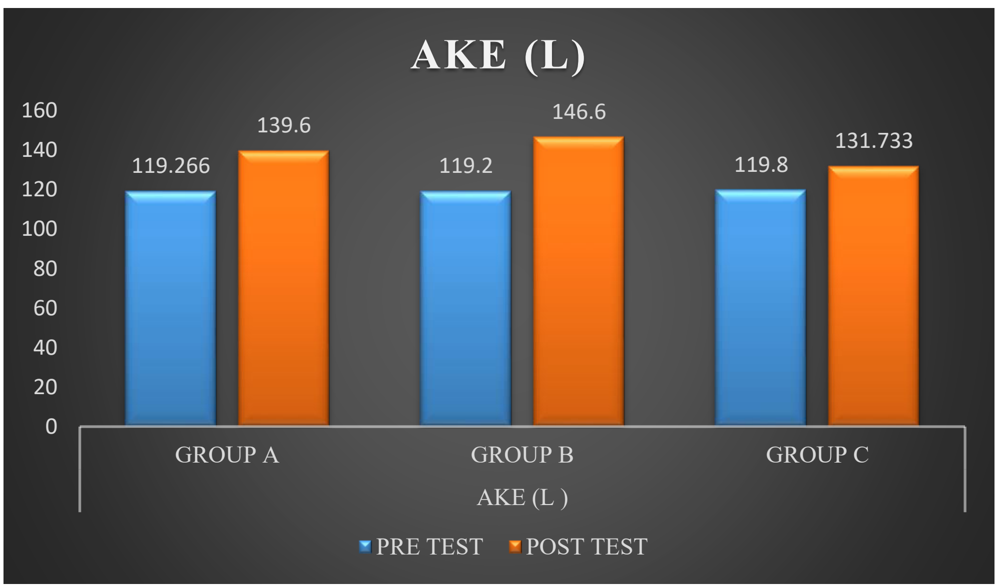

Figure 8: Pretest and posttest values of Active Knee extension test (Left) for Group A, Group B & Group C

Overall Interpretation

All three intervention groups demonstrated statistically significant improvements in hamstring flexibility following treatment. However, Group B, who received Sub occipital muscle inhibition technique, showed superior improvement compared to Group A and Group C, who received Myofascial release technique and Static stretching respectively in active knee extension measures.

Discussion

According to a 2017 study by Ghulam Fatima et al., the majority of students have tight hamstrings, and prolonged sitting can cause this. It is one of the factor that contributes to hamstring tightness.[11]

The purpose of this study was to compare the impact of the myofascial release, sub occipital muscle inhibition technique and static stretching on hamstring flexibility in IT professionals with hamstring tightness. AKE was used to determine hamstring flexibility both before and after the intervention.

The fascia links have been extensively researched by several authors. Because the sub occipital inhibition technique has the potential to improve the flexibility of the hamstring. Sub occipital inhibition involved loosening the superficial backline by releasing the sub occipital muscles. [20, 30]

According to Sung-Hak Cho et al., 2014, giving SMI and SMFR to subjects with hamstring shortening resulted in an instant increase in the hamstring's flexibility was assessed, and SMI was found to be superior.[15]Furthermore, studies on the effects of SMI on hamstring flexibility have revealed that the connection between postural control, dura mater, and myofascial chain, all of which contribute to improved flexibility, was demonstrated by Robert Scleip in 1996, and that this also supports the results of this study. [9, 31]

The sub occipital inhibition method improved the flexibility of the hamstring muscles and increased the ROM of the straight leg in people with short hamstring syndrome. As demonstrated by Aparicio et al. in 2009. Their research included a majority of young people, who were roughly at this age. The same age as the participants in our study. Following the treatment, there was a significant increase in AKE for the SMI group, along with evidence of greater hamstring flexibility. [32]

The effects of MFR are varied; it improves flexibility, lessens pain, lessens delayed onset muscle discomfort, and regulates the autonomic nervous system [33, 34, 35, 36]. In this study, the remote MFR's positive impact on hamstring flexibility may be explained by the fascially mediated transfer of forces across. The evidence implies that in SBL, forces are transmitted via intramuscular connective tissue channels [37, 38, 39, 40].

In healthy individuals, static stretching is a well-known approach for enhancing hamstring flexibility [43]. The suggested mechanism that might be behind this is as follows: by changing sensation [48], increasing the number of sarcomeres in series, increasing viscoelasticity, and decreasing the stiffness of muscles and connective tissue[44, 45], and increasing stretch tolerance [46, 47].

The possibility that all the methods may improve the hamstring's flexibility could be due to the sub occipital muscles being relaxed, which in turn relaxes the superficial back line. The findings of this study, which used myofascial release and sub occipital inhibition therapy on participants with hamstring tightness, demonstrated an increase in confirmed that SMI was more effective in hamstring flexibility. These results were expanded upon by our findings, which demonstrated that flexibility was increased more when the procedure was done in combination.

Conclusion

The study found a statistically significant improvement in hamstring flexibility in all three groups after four weeks of treatment. The Suboccipital muscle inhibition technique group, on the other hand, performed better than the Myofascial release therapy and Static stretching group. In summary, the study found that among IT professionals with hamstring tightness, the Sub occipital muscle inhibition technique was more effective at improving the flexibility of hamstrings.

Limitations and recommendations

Due to its short duration, small sample size, restricted age range & single gender selection, and absence of follow-up, the study's results are less generalizable and have less long-term validity. The effects of external variables such as participant diversity, contextual factors, and weather conditions were not adequately controlled. Future studies should use larger sample sizes, longer time periods, age group stratification, and long-term follow-up to corroborate and expand on these results. More research should focus on the impact of the sub occipital muscle inhibition method on other important consequences, such as quality of life, disability assessment, and its applicability to other ailments like plantar fasciitis and low back pain.

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