



EFFECTIVENESS OF MYOFASCIAL RELEASE AND FOAM ROLLING ON HAMSTRING IN YOUNG ATHLETE- A COMPARITIVE STUDY)

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Abstract: A total of 40 athletic population including both gender (male and female) of age group from 15 to 35, who meets the inclusion and exclusion criteria were included in this study. All of them took part in the study on a voluntary basis after signing consent, the subject divided into two groups 20 in each group by non-probability sampling, group 1 with 20 subject (myofascial release was given), group two with 20 subject (foam rolling is done for about 4 minutes in the specified area) and the outcome measures were taken, ACTIVE KNEE EXTENSION (AKE), PASSIVE STRAIGHT LEG RAISE (PSLR), SIT AND REACH TEST (SRT) and NUMERIC PAIN SCALE (NPS), the MFR was given total of 4 session (twice per week) for two weeks where as foam rolling was for about 2 minutes group A and B result showed highly significant improvement in the SRT and NRS in the week 2 analysis

Keywords – foam rolling, myofascial release, hamstring release, hamstring flexibility.

INTRODUCTION

Hamstring muscles belong from the posterior compartment of the thigh they are also called as the ‘flexor compartment’. It consists of the four muscles i.e. semitendinosus, semimembranosus, long head of the biceps femoris and adductor magnus ^[1]. Hamstring muscle is a two joint muscle spanning both hip joint and knee joints, functioning as a major muscle, knee flexion. In ambulation, hamstring provides dynamic stability. Interaction with hamstring provides correct knee movement and stability. The muscular strength ratio to quadriceps and hamstring plays an important role in hip and knee joint stability as well. ^[2] Hamstrings injuries are the most common injuries seen in the sports person ^[3]. Hamstrings injuries commonly occurs in the sports such as runners, soccer, rugby, football players. There is no explained or definite cause for the hamstrings injuries but several possibilities which can lead to the hamstrings injuries which includes ^[4,5]

- Inadequate flexibility
- Muscle weakness
- Muscular strength imbalance
- Unsatisfactory warm-up
- Fatigue
- Soreness
- Ethnicity
- Age
- Poor running biomechanics

Occurrence of any injury may be due the fault of intrinsic and extrinsic factors. Extrinsic factors mainly constitute of environment and intrinsic factor mainly involves the aspects within the athlete body ^[6]

Currently there is no definite treatment protocol for the hamstrings injuries that has been determined to result in the best outcome

^[8] The re-injury of the hamstrings are more severe than the first time and malimit the activities of the athletes ^[10].

MYOFASCIAL RELEASE

In recent years for treating soft tissue injuries myofascial release technique has been used. Myofascial release can be done by the two technique self myofascial release (SMR) or by therapist or by differe (MFR).

Exerting mechanical pressure is being theorized to decrease the adhesions between the layers of the soft tissue, it also improves the muscle compliance and decreases the stiffness of the soft tissues which are the cause of the decreased flexibility and reduce athletic performance ^[11].

MYOFASCIAL RELEASE

Normally done by the other individual. It can be done by the therapist.

The primary purpose of the approaches is to treat symptomatic soft tissue injury of dysfunction. The functional orthopaedics approach to soft tissue mobilization (STM) has been developed not only for the evaluation and treating soft tissue dysfunctions that precipitate myofascial pain but also for the evaluation and treating the those dysfunctions that causes the alteration in structure and function and produce mechanical strains on symptomatic structures. This approach is integrated into a broader treatment strategy of joint mobilization and neuromuscular re-education and is coupled with a specific training, conditioning, and flexibility program^[12]

MFR is a collection of techniques used for the purpose of relieving soft tissue from an abnormal hold of a tight fascia .Direct bodily effects range as follows:

- Alleviation of pain
- Improvement of athletic performance
- Greater flexibility and ease of movement to more subjective concerns such as better posture.

More indirect goals include emotional release, deep relaxation, or general feelings of connection and wellbeing. MFR is better understood as a goal-oriented approach to working with tissue-based restrictions and their two-way interactions with movement and posture ^[13]

SELF MYOFASCIAL RELEASE (SMR)

Done by the individual itself by the some rollers which can be hard such as wooden roller or soft or semi rigid such as foam roller. It is more convenient and less expensive as compared to MFR. The most commonly used tool for SMR is the foam rollers and massage balls. Foam rollers can be used to improve the following:

- Core stability
- Balance
- Proprioception
- Soft tissue mobility, and
- Body awareness

There are different ranges in the availability of the foam rollers in the aspect of size, shape, density and firmness. The foam rollers can be used at any different regions of the body such as gluteal region, quadriceps regions, back muscles , hamstrings etc. By applying the high pressure on the muscle fibres mainly on belly by the foam roller mainly results in the muscle relaxation^[14]. Muscle relaxation mainly occurs due the increase blood supply and oxygen supply and release of the relaxation hormones and endorphins^[15]

Shah S.et al in the year 2012 did the study “**effect of myofascial release on hamstrings tightness in healthy individuals**” which was an experimental comparative study .A random sample of 31 students were taken after giving due consideration to inclusion and exclusion criteria. All of them took part in study on a voluntary basis after signing consent. Sample size includes 31 people and two groups were formed. Subjects were divided into 2 groups. Group A (n=16) in which end position of MFR was maintained for 30 seconds and in Group B (n=15) in which end position of MFR was maintained for 60 seconds. MFR was given with subjects in prone position for both. It is concluded from the study that, both groups showed highly statistically increase in ROM of hamstring muscles bilaterally based upon their passive SLR test; But when comparing two groups, there was no statistically significant difference in improvement of ROM of hamstring muscles.^[13]

Couture G.et al in year 2015 did the study “**The effect of foam rolling duration on hamstring range of motion**”.Researcher conducted study to see effect of foam rolling on hamstrings muscle.The outcome measure was to measure the knee extension before and after treatment. The study revealed that the self-administered foam rolling for a total duration of up to 2 minutes is not adequate to induce improvements in knee joint flexibility but longer duration have better effect on the flexibility. Contributing factors may include the amount of pressure imparted by the commercial roller as well as duration of treatment.^[20]

RESEARCH METHODOLOGY

The other researcher have conducted experiments in determining the individual effects of the manual myofascial release and self myofascial release via foam rollers with the stretching. This study mainly compares the effects of the manual and self myofascial release which will be more effective for the athletic population and which will enhance the performance of the athlete. The effectiveness is measured via improvement in the outcome measures.

AIM: Effect of myofascial release and foam rolling on hamstring muscles in athlete- a comparative study

OBJECTIVES –

- 1.) To observe the effects of foam rolling on the hamstring muscles on range of motion , flexibility and pain.
- 2.) To observe the effects of myofascial release on the hamstrings muscles on range of motion , flexibility and pain.
- 3.) To compare the effect between the foam rolling and manual myofascial release.

HYPOTHESIS

Null hypothesis- There is no significant difference between effect of myofascial release and foam rolling on hamstring muscle

Experimental hypothesis- There is significant difference between myofascial release and foam rolling on hamstring muscle

Selection Criteria:**Inclusion Criteria:**

- 1.) Age-15-35
- 2.) Hamstrings are tight and passive straight leg raising (SLR) range was between 30-70
- 3.) Both males and females who are highly active
- 4.) Beighton score less than 4

Exclusion Criteria:

- 1.) Any fracture of spine or lower limb within last 6 months
- 2.) Tight rectus femoris
- 3.) Tight ilio psoas
- 4.) Hypersensitive to skin
- 5.) Beighton score more than 4
- 6.) Past hamstring injury

Independent Variable:

- 1.) Exercise protocol 1 (Myofascial release)
Exercise protocol 2 (foam rolling)
- 2.) Age
- 3.) Gender

Dependent Variable:

- 1.) Beighton score
- 2.) Goniometer as tool for assessment
- 3.) Numeric rating scale (NRS)
- 4.) Sit and reach flexibility test
- 5.) Active knee extension test

Place of Data Collection: A+ orthopaedic and sports medicine centre

Sample Size: 40

Instruments Required: Goniometer, beighton score, Numeric rating scale for pain

Group Allocation: Two groups will be created.

- Exercise group 1 (myofascial release)
- Exercise group 2 (foam rolling)

Procedure: Forty subjects of both genders with the age 15-35 years who will meet the inclusion criterion will be included in the study. The subjects will be explained about the entire procedure and informed consent for doing the intervention will be taken. After the selection of subject according to inclusion and exclusion criteria the patients will be divided into two groups 20 in each group by non- probability sampling.

Each patient will be assessed pre and post intervention by goniometer for assessment of ranges, sit and reach test for flexibility and numeric rating scale for pain. The results will be compared. The interventions will be given for 3 days in a week and follow up of 1 week is done in the foam rolling and in manual myofascial release is given 2 times per week for weeks are pre and post intervention are measured.

In group 1 manual myofascial release for the releasing of muscle fibers. Preliminary testing included the sit and reach test (SRT), hip joint passive and active ROM in supine position, and assessment of hamstrings is done by active knee extension test. This is given 2 times per week for 2 weeks.

Method of manual myofascial release- It is given in the prone position with the use of the ulnar border of the hand from proximal to distal direction using light amount of pressure over hamstring muscles(as shown in figure 1). The therapist had scaled the pressure following contact until the slack in the skin was taken up and that position was held until the tissues begins to soften.

In group 2 foam roller is used for the releasing of muscle fibers. Preliminary testing included the sit and reach test (SRT), hip joint passive and active ROM in supine position, and assessment of hamstrings is done by active knee extension test. Foam roller will be applied for 3 days at the same time of day at 24-hour intervals. The application area will be randomly chosen for each subject, and foam roller will be applied to one of the areas each day.

Method of foam rolling- subjects assumed a long sitting position on a firm and even surface by placing the arms backward and loading body weight on the palms. A foam roller was placed under the hamstrings(as shown in fig.2) and slowly moved back and forth from the ischial tuberosity to the popliteus, by applying pressure for 4 minutes.

Numeric rating scale for pain will be taken. In this scale, the patient will be asked to rate the pain by giving a numeric value ranging 0 being minimum and 10 being maximum.

Goniometer and active knee extension test will measure the range of motion of hip and knee.

Sit and reach test is done to measure the flexibility of the hamstring muscles.

3.4 Data analysis

The results were analyzed on MS Excel sheet. The t-test is used to analyze the result and to measure the significance.

The data collected is analyzed by comparison of the two techniques.

T test is applied. For analysing the pre-treatment and post-treatment results of various variables, Paired T-test is applied in both manual myofascial release and self myofascial release. For analysing the results of both the techniques, T-test with unequal variance is used.

A total of 40 subjects were taken. Each group consists of 20 subjects. Analysis is done on the post treatment reading of the active knee extension, passive leg raise , sit and reach test and numeric rate scale.

NUMERIC RATING SCALE:

0 – No pain

5- Moderate pain

10- Worst pain possible

The mean is calculated and using t-test, t-stat and t-critical values are obtained. Using these values, significance is obtained.

If $t\text{-stat} > t\text{-critical}$ = SIGNIFICANT,

If $t\text{-stat} < t\text{-critical}$ = INSIGNIFICANT.

INTERGROUP COMPARISON

PARAMETERS	GROUP 1 MEAN	GROUP 2 WEEK 1 MEAN	COMPARISON BETWEEN GROUPS		
			t- stat value	T-CRITICAL VALUE	SIGNIFICANCE
ACTIVE KNEE EXTENSION (AKE)	54.75	58.35	-1.62881	2.024394	Insignificant
PASSIVE STRAIGHT LEG RAISE (PSLR)	66.15	68.6	-0.86516	2.024394	Insignificant
SIT AND REACH TEST (SRT)	10.875	8.95	2.545102	2.024394	Significant
NUMERIC PAIN SCALE (NRS)	1.45	2.4	-5.9308	2.024394	Significant

Table 1- Shows the 4 different variables,with their average, variance and unpaired t-test value (week1)

PARAMETERS	GROUP 1 MEAN	GROUP 2 WEEK 2 MEAN	COMPARISON BETWEEN GROUPS		
			t- stat value	T- CRITICAL VALUE	SIGNIFICANCE
ACTIVE KNEE EXTENSION (AKE)	54.75	64.75	-5.21827	2.024394	Significant
PASSIVE STRAIGHT LEG RAISE (PSLR)	66.15	71	-2.86041	2.024394	Significant
SIT AND REACH TEST (SRT)	10.875	10.15	1.028048	2.024394	Insignificant
NUMERIC PAIN SCALE (NRS)	1.45	1.45	0	2.024394	Insignificant

Table 2- Table 1- Shows the 4 different variables, with their average, variance and unpaired t-test value (week 2)

3.4.1 Result

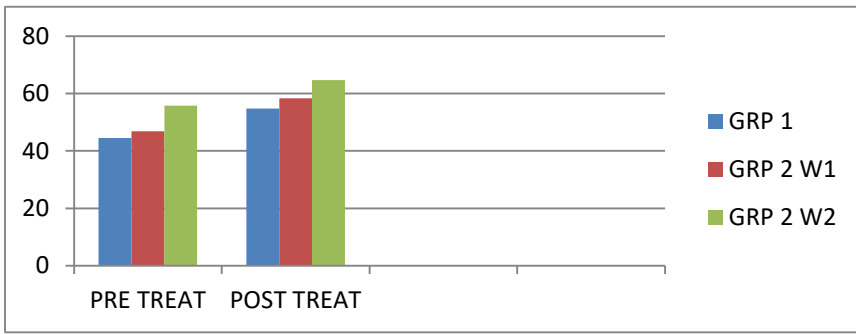
GROUP 1 (Grp 1) – FAOM ROLLING(SMR)

GROUP 2 (Grp 2) – MANUAL MYOFASCIAL RELEASE

ACTIVE KNEE EXTENSION (AKE)

AKE	GROUP 1	GROUP 2 WEEK 1	GROUP 2 WEEK 2
PRE TREATMENT MEAN	44.5	46.85	55.75
POST TREATMENT MEAN	54.75	58.35	64.75
t-STAT VALUE	-5.30285	-6.46334	-9.5428
T- CRITICAL	1.729133	1.729133	1.729133
SIGNIFICANCE	SIGNIFICANT	SIGNIFICANT	SIGNIFICANT

TABLE 3 - Comparison of active knee extension pre- treatment and post- treatment pain in group 1 and

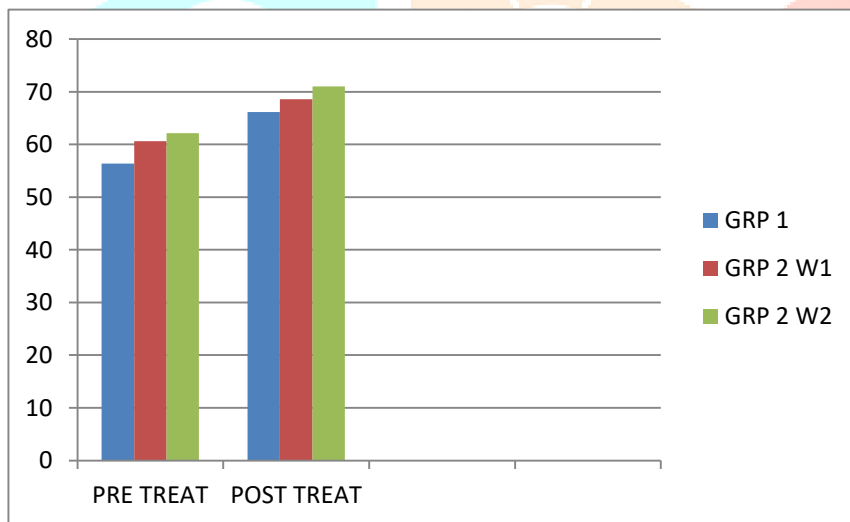


W1- WEEK 1
W2- WEEK 2

PASSIVE STRAIGHT LEG RAISE (PSLR)

PSLR	GROUP 1	GROUP 2 WEEK 1	GROUP 2 WEEK 2
PRE TREATMENT MEAN	56.4	60.6	62.15
POST TREATMENT MEAN	66.15	68.6	71
t-STAT VALUE	-5.32961	-5.2333	-7.33921
T- CRITICAL	1.729133	1.729133	1.729133
SIGNIFICANCE	SIGNIFICANT	SIGNIFICANT	SIGNIFICANT

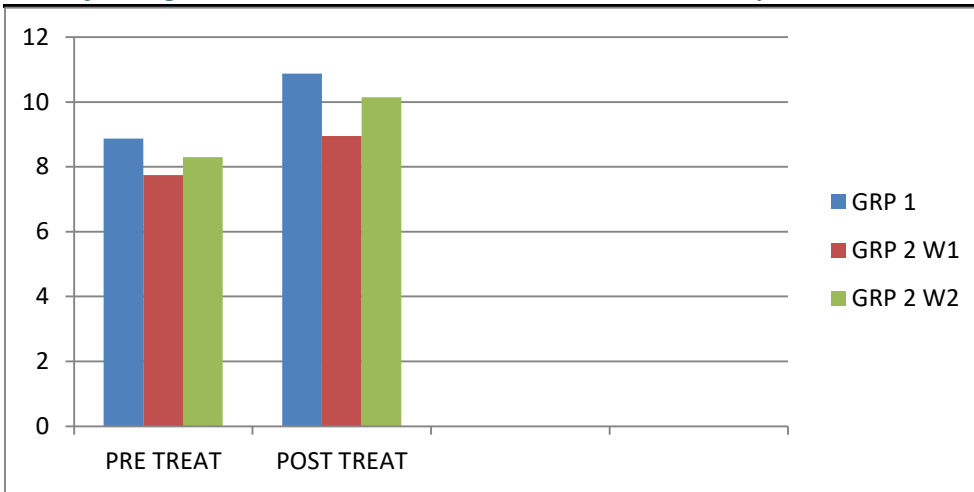
TABLE 4 - Comparison of active Passive straight leg raise pre- treatment and post- treatment pain in group 1 and group 2.



SIT AND REACH TEST (SRT)

SRT	GROUP 1	GROUP 2 WEEK 1	GROUP 2 WEEK 2
PRE TREATMENT MEAN	8.875	7.75	8.3
POST TREATMENT MEAN	10.875	8.95	10.15
t-STAT VALUE	-9.59798	-6.101188	-9.00173
T- CRITICAL	1.729133	1.729133	1.729133
SIGNIFICANCE	SIGNIFICANT	SIGNIFICANT	SIGNIFICANT

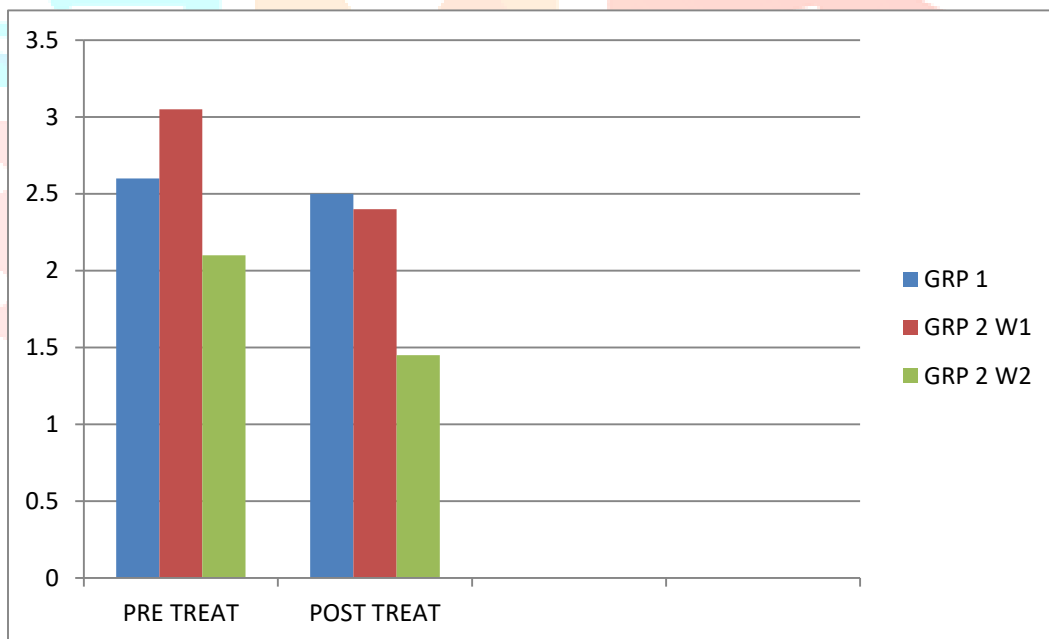
TABLE 5 - Comparison of active sit and reach test pre- treatment and post- treatment pain in group 1 and group 2.



NUMERIC PAIN SCALE (NRS)

NRS	GROUP 1	GROUP 2 WEEK 1	GROUP 2 WEEK 2
PRE TREATMENT MEAN	2.6	3.05	2.1
POST TREATMENT MEAN	1.45	2.4	1.45
t-STAT VALUE	5.877033	2.941936	3.901027
T- CRITICAL	1.729133	1.729133	1.729133
SIGNIFICANCE	SIGNIFICANT	SIGNIFICANT	SIGNIFICANT

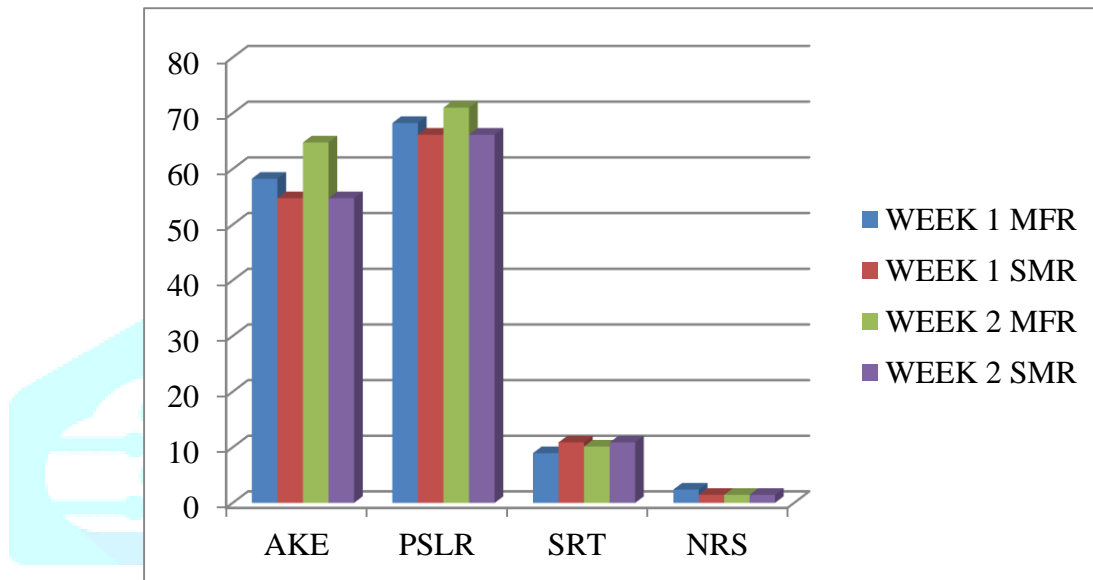
TABLE 6 - Comparison of numeric pain scale pre- treatment and post- treatment pain in group 1 and group 2.



COMPARITIVE STUDY BETWEEN MFR AND SMR

OUTCOME MEASURE	WEEK 1		WEEK 2	
	MANUAL MYOFASCIAL RELEASE (MFR)	FOAM ROLLING (SMR)	MANUAL MYOFASCIAL RELEASE (MFR)	FOAM ROLLING (SMR)
Active knee extension (AKE)	58.25	54.75	64.75	54.75
Passive straight leg raise (PSLR)	68.25	66.15	71	66.15
Sit and reach test (SRT)	8.95	10.875	10.15	10.875
Numeric pain scale (NRS)	2.4	1.45	1.45	1.45

Table 7 - Showing the mean and stdev in comparison with the other group



AKE-Active knee extension
 PSLR-Passive straight leg raise
 SRT-Sit and reach test
 NRS- Numeric pain rate scale

In the intragroup analysis i.e. within the group paired t-test is used

In group 1(MFR) the results are measured according to the week i.e.,week 1 data and week 2(SMR) data are separately measured. According to the paired t-test in group 1, week 1- significant difference is seen all the parameters i.e. active and passive range of motion, sit and reach test for flexibility and pain.

According to the paired t-test in group 1, week 2- significant difference is seen all the parameters i.e. active and passive range of motion, sit and reach test for flexibility and pain.

In the intragroup analysis i.e. within the group paired t-test is used.

In the group2(SMR) the results are according to the day1 and day7 protocol.

According to the paired t-test in group 2, day 1 and day 7- significant difference is seen all the parameters i.e. active and passive range of motion, sit and reach test for flexibility and pain.

In the intergroup analysis i.e. between the groups unpaired t-test is used to analyze the results.

Group 1, week 1 and group 2 data is analysed and significant difference is seen in the following parameters- pain scale(NRS) and sit and reach test(SRT).

Insignificant difference is seen the following parameters- active knee extension(AKE) and passive straight leg raise(PSLR).

Group 1, week 2 and group 2 data is analysed and significant difference is seen the following parameters- active knee extension(AKE) and passive straight leg raise(PSLR).

Insignificant difference is seen in the following parameters- pain scale(NRS) and sit and reach test(SRT).

3.4.2 Discussion

The present study tells about the comparison between the effects of manual myofascial release and self myofascial release via foam roller on the hamstring muscles on the athletic population. There were 2 groups made- 20 subjects in each group selected on the criteria of tight muscles, decreased range of motion, decreased athletic performance due to the tightness and decreased flexibility, age group 15-35, both males and females. The paired t test is used between the intragroup analysis and results and unpaired t test is used between the group 1 and group 2 for analysis and results. In intergroup, there have been significance difference is seen in NRS and SRT in week 1 analysis. In the week 2 analysis significant difference seen in the AKE and PSLR. It is seen that there is significant difference in all the outcome measures in analysing the intragroup results. The study conducted by the Jung J. who studied immediate effect of self myofascial release on hamstring flexibility on 25 individuals with mean age of 22 years. He explained the technique of foam rolling and it was conducted for 4 minutes on the suboccipital, hamstrings and plantar regions and then outcome were measured. Significant differences is seen in the AROM and PROM which is measured by the straight leg test, using SRT which is used to measure the flexibility of the muscle.

The present study tells about the comparison between the effects of manual myofascial release and self myofascial release on the hamstring muscles on the athletic population. There were 2 groups made- 20 subjects in each group selected on the criteria of tight muscles, decreased range of motion, decreased athletic performance due to the tightness and decreased flexibility, age group 15-35, both males and females. The paired t test is used between the intergroup analysis and results and unpaired t test is used between the group 1 and group 2 analysis and results. In intergroup, there have been significance difference is seen in NRS and SRT in week 1 analysis. In the week 2 analysis significant difference seen in the AKE and PSLR. It is seen that there is significant difference in all the outcome measures. The study conducted by the Salvi shah, 2012 has done the study on the effects of the myofascial release on the hamstring muscles. In this total sample size was 31 and the researcher divided the sample in the 2 groups i.e. group A end position of MFR was maintained for 30 seconds Group B end position of MFR maintained for 60 seconds. Group analysis showed statistical difference while between group analysis showed significant difference.

Hamstring tightness causes pelvic posterior tilting and postural imbalance. Consistent use of self-MFR and manual myofascial release can help maintain hamstring flexibility. Self-MFR can be used by busy individuals and only requires a simple tool. If individual have time and need long term effects he can also opt for manual myofascial release. Hamstring tightness or shortening occurs in those with a sedentary lifestyle or inadequate exercise. Self-MFR and manual myofascial release could prevent and treat hamstring disorders and can improve athletic performance.

3.4 Limitation of the study

#FOR SELF MYOFASCIAL RELEASE

1. The study was performed only for the week.
2. The participation in this study were not all the same fitness levels and had different lifestyle and routines.
3. This study has a small sample size.
4. Due to the difference in the weight, the pressure exerted during foam rolling is mainly subjective in nature.

#MANUAL MYOFASCIAL RELEASE

1. The proposed protocol was to do 12 sessions in the two week which is not suitable for the athletes i.e.6 sessions/week, as it does not allow the healing process.
2. The pressure exerted by the therapist can differ hence it is advisable to do the practice by the same therapist.
3. This study has a small sample size.

The body compositions of the participation in the study were not all same fitness and have different routine.

3.4.2.2 Conclusion

The aim of the study to study the comparative effects of the manual myofascial release and self myofascial release via foam rolling on the hamstring muscles in the young athlete population.

Through the study it is concluded that the individual effects of the release are very significant and comparative analysis shows significant results in the pain and hamstrings flexibility which is measured via sit and reach in week 1.

In week 2 significant result are seen in the range of motion which is being measured via the active knee extension and passive straight leg raise.

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