European Journal of
Health Sciences
(EJHS)

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AJP

European Journal of Health Sciences
ISSN 2520-4645 (online)
Vol.6, Issue 2, pp 18-29 2021

www.ajpojournals.org

COMPARISON OF MASSAGE THERAPY AND PASSIVE STRETCHING FOR REDUCING DOMS OF TIBIALIS ANTERIOR

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Abstract

Purpose: To find the effect of massage therapy in comparison with static stretching for reducing DOMS in tibialis anterior muscle and to assess their effect on performance of athletes with these therapies.

Methodology: An experimental study was done in Imperial University Lahore for the duration of 06 months from 15 August to February 15. Participants were selected through non-probability convenience sampling technique as per inclusion criteria. Sample size was 40, from which participants were equally divided into two groups; Group-A (massage therapy) and Group-B (static stretching). DOMS were induced in tibialis anterior mucle and assessments was carried out before intervention and after applying intervention using NPRS, vertical jump height test, and sprint speed test.

Findings: Both massage therapy and passive static stretching techniques were found to be effective for reducing the muscle soreness in the tibialis anterior muscle, as well as for improving players' performance. However, within group analysis shows that passive static stretching significantly improves the vertical jump height and sprint speed duration in the athletes.
Unique contribution to theory, practice and policy: The literature regarding the comparison of two techniques (massage & passive static stretching) is lacking especially their effect on tibialis anterior. This study fills the gap and will guide sports rehabilitators and trainers to devise better intervention strategies for countering the symptoms of DOMS and its effects on performance.

Keywords: *Athletes, DOMS, Massage Therapy, Passive Stretching, Tibialis Anterior.*

1.0 INTRODUCTION

DOMS (delayed onset muscle soreness) is very common problem in athletes as a result of physical exertion. It is the pain or discomfort in the affected muscles after following new exercise program or doing eccentric training. The pain caused by DOMS usually increases in intensity after 24 hours of exercise or training and it may remain on peak till 72 hours then it begins to slow down or decreases by 5 to 7 post training/exercise days(1).

Despite years of research started from 1900 to till date the underlying mechanism od DOMS is still unclear(2), whether the tissue damage is caused at mechanical, cellular or neural level. Many theories regarding DOMS has been proposed and some are disproved. Early researchers proposed a theory named metabolic waste accumulation theory, which states that buildup of lactic acid in the muscle after exercise is the cause of acute and delayed onset muscle soreness, although this is a source of muscular pain with the acute training or exercise, later this theory has been disproved stating the fact that it doesn't cause DOMS(3)

Till date not effective treatment of DOMS after it has occurred has been reported in literature. Some evidence shows that if you continue the training that induced delayed onset muscle soreness (DOMS) does not slow down the recovery or healing process neither it can damage the muscle further. (4) Some studies suggest light, high speed isokinetic, concentric exercises to reduce the muscle soreness and the revival of the lost strength, but some studies show that light exercises have no effect for reducing soreness and noteworthy increase in strength.

DOMS is very dangerous for an athletic performance, even a light pain from DOMS can negatively affects the performance and increase the chances of injury which then stops him to take part in the ongoing competition. We are trying to make an effective treatment strategy to overcome DOMS and its related potential harmful factors so that physical therapist helps the athlete to recover as soon as possible, speed up the regeneration process and prevent the further damage (5).

Tibialis anterior muscle lies on the lower part of the lower limb on the anterior side, it is the fusiform muscle which lies superficially in the leg which makes it easily palpable lateral to the anterior border of tibia. The main function of this muscle is dorsiflexion and inversion of foot at the talocrural joint and subtalar joint respectively, both actions play very vital role in the completion of the gait cycle.

Tibialis Anterior muscle plays a significant part in the activities of hiking, walking, kicking a ball by providing stabilization at the ankle joint it also supports and stabilize the medial part of the longitudinal arch of the foot during movement. When DOMS occur in this muscle the performance of athlete automatically minimizes and he or she cannot compete at professional level unless they get rid of DOMS.

1.1 Statement of the Problem

The literature regarding the comparison of two techniques (massage & passive static stretching) is lacking especially their effect on tibialis anterior. This study fills the gap and will guide sports rehabilitators and trainers to devise better intervention strategies for countering the symptoms of DOMS and its effects on performance.

1.2 Objectives of the Study

- To find the effect of Massage therapy in comparison with Static stretching for reducing DOMS in tibialis anterior muscle.
- To find the effect of Massage therapy and Static stretching on the performance of athlete

2.0 LITERATURE REVIEW

Numerous studies about effect of stretching for reducing DOMS have been done over the past several years, most studies have been inundated by methodological errors or inconsistencies so it's difficult to draw any conclusions from those studies about exact effect of the given treatment. Herbert RD et al conducted a meta-analysis of five studies on the effect of stretching on DOMS. The studies were conducted on healthy adults. Stretching time for per session was between three hundred and six hundred seconds. In one study effect on calf muscle was investigated, and in the other, prevention of injuries was investigated in the muscles of lower limb, both protocols start with warmup exercises, the collective estimates shows that there are not significant results for reducing the risk of DOMS. Only one study finds the effects of stretching on DOMS for improvement of athletic performance, but it also had inconclusive results. (6)

Lorenzo Visconti et al conducted a study to find the results of massage therapy in ultramarathon runners. This type of sports is related to marathon, but it has more distance, its gaining popularity worldwide, these runners face several musculoskeletal problems and one of the main problems is DOMS specially if it occurs in lower limb and ultimately affects their muscle strength. Total of 231 patients participated in the study. 20-minute massage session was given with a neutral cream, posterior muscles of the lower limb were accessed through prone position and anterior muscles through supine position. Effleurage technique was used in this study without causing the pain to the subject. NPRS was used before and after treatment for the perception of pain. It was concluded that massage is safe and effective technique for DOMS related soreness and pain if it applies when the DOMS is at its peak. But the mechanism is still unknown that how massage reduces DOMS because it does not respond to medications and rest but responds positively to massage. Future studies needed to explore this point (7).

Johansson et al in his study investigate that there is no positive effect of passive stretching before the exercise on the muscle tenderness, soreness and loss of strength following the new training of eccentric exercise. Lund et al state that there is no positive effect of passive or dynamic stretching after the eccentric exercise, but they are not sure about the efficacy of the results. Similarly, in a systematic review which was an RCT states that no matter at what point you stretch the muscle it has no clinically positive effect on DOMS. However, no study tells the intensity of stretching, so the study by Nikos et al has an objective to investigate the effects the low and high

intensity static passive stretching with comparison of no stretching in a control group. It was hypothesized that low intensity static passive exercises if done for three consecutive days would lower the muscle soreness which is perceived my patient and improves muscle function than high intensity passive stretching exercise or with no stretching(8).

Vestergaard-Poulsen et al tells in his study that DOMS is caused by the disruption of muscle fiber at the cellular level and in turn decreases the muscle strength, he also states that studies are lacking on the role of stretching in alleviating symptoms of DOMS so his study was focused to measure the effectiveness of passive stretching on quadriceps muscle on DOMS, muscle strength, Pcr/Pi and plasma-CK ratio. Patient was placed in prone position, first stretch was given up to 30 seconds, then the stretch was repeated for two more times and the rest interval between them was 30 to 50 seconds between each stretch, so overall in each session a ninety second stretch was given to the quadriceps muscle. Some patients report immediate pain relief after the stretching procedure, but that effect lasts only for few minutes. All patients' experiences muscle pain during stretching and they report maximum pain on day two after the induction of DOMS(9).

In a study by Dain P et al both techniques of stretching were used (static and ballistic). Ballistic stretching is not generally used as many people thought that it is more expected to cause injury, but this fact is not documented in literature. In fact, Smith et al suggested that both ballistic and static stretching improves ROM and DOMS(10). Massage is used very widely as a therapeutic modality from recovery of muscular soreness and injury and one of the most common treatment methods in the field of sports(11).

Sven Jönhagen et al conducted a study on sports massage in which 16 subjects 8 male and 8 female were participated in the study. All subjects were healthy and had no injury, they exercised 3 times per week. After ten minutes of exercise all participants treated with sports massage by a professional physical therapist, one leg was experimental side and other was a control side, their entire front thigh was massaged. Treatment of massage therapy include 10 minutes of effleurage and then eight minutes of petrissage. Massage was given daily for 10 minutes. Both groups performed strength tests before and after the treatment. Pain perception was evaluated by visual analog scale (VAS), after the massage the VAS score was 2.2 for the test leg and 2.1 for the control leg. This study shows the results that sports massage had no effect in reducing DOMS, so it is interesting to researchers that why athletes ask for sports massage when there is no significance of massage in reducing DOMS(12).

In a study by Zainal Zainuddin about effects of massage on delayed onset muscle soreness and swelling they used an arm-to-arm comparison of two variables (massage and control). The purpose of the study was to examine the effects of massage on DOMS, muscular strength and ROM, 10 healthy participants were included in the study with no history of upper arm injury. Arm-to-arm model means one arm serves as a treatment group and other arm as a control group, this model is best to see the results of a specified treatment. Treatment subjects received sports massage therapy for 10 minutes after the exercise, 10 minutes massage includes effleurage of the limb for 2 minutes and thirty seconds, petrissage of the arm for 1 minute, friction massage to the arm for 2 minutes and at the end additional 2 minutes and thirty seconds of effleurage massage was given. The therapist tried to keep the depth and rate of massage uniform throughout the session. The findings of the study revealed that massage was effective for reducing DOMS in addition massage

have noteworthy effects on swelling and CK response. They found that massage therapy reduces muscle soreness by more than thirty percent when compared to the control group(13).

J E Hilbert et al conducted a study to find the effects of massage on muscle soreness. In this study 18 participants were included randomly to either a control or massage group. DOMS was induced in the hamstrings muscle then the 20 minutes sham massage treatment was given after 2 hours post exercise, the conclusion of the study states that muscle function was not improved with massage but the soreness of the muscle was significantly decreased(11).

Diverse studies are present on the effects of stretching and massage for reducing DOMS, some studies support the use of static stretching after the DOMS while some rejects that stretching has no effect to reduce muscle soreness, same with the massage therapy, some authors suggest massage is beneficial if it applies after the strenuous exercise but before the appearance of DOMS, while some states that it has beneficial results if applied after the DOMS. In the present study it was found that the effect of both therapies in comparison to see the effects on the tibialis anterior muscle.

3.0 RESEARCH METHODOLOGY

3.1 Study Duration:

The study duration was 6 months after the approval of the research board.

3.2 Sample Size:

Sample size was 40

3.3 Study Design:

It was a randomized clinical trial.

3.4 Sampling Technique:

Non-probability convenient sampling was used.

3.5 Study Setting:

Data collected from the off-season male athletes of Imperial University Lahore

3.6 Intervention Details

3.6.1. Induction of DOMS:

DOMS were induced in the selected healthy off season athletes with no lower extremity injury and no recent history of strength training by performing three sets of test side ankle eccentric plantar flexion were performed with 20 seconds rest in between. The subject stand on a 13 cm high platform with the heel of the test side leg on the edge of the platform with the mid and forefoot outspreading over the edge. The palms of the athlete were to be placed on the wall at shoulder level for the support. The athlete made a slow plantar flexion of the ankle allowing the forefoot to drop away until the toes touched the ground. Then the athlete returned to the initial starting position. Athlete repeats this process twenty times per set (33).

3.6.2. Massage Technique:

Sports massage were used for this study due to its effectiveness and many studies uses the same type of massage for lower extremity. The duration of massage were ten minutes (for 3 days) including effleurage (stroking) (2 min), petrissage (kneading) (2 min), tapotement (percussion) (2

min) and Deep tissue massage (2 min) on the tibialis anterior muscle and 2 mins additional effleurage at the end(28).

3.6.3. Static Stretching:

Four repetitions of 20 seconds static stretch were performed on three consecutive days with 20 seconds rest among each session to avoid the pain caused by stretching(34).Most authors suggest that stretch between 10 to 30 seconds is sufficient.
Frequency & Intensity: 4 x 20 = 80 second stretch each day.

3.7. Selection criteria:
3.7.1. Inclusion Criteria:

- Off season male athletes who are member of university team
- Athletes with age group of 18 to 30

3.7.2. Exclusion Criteria:

Individuals were excluded if they were:

- Taking anti-inflammatory medication
- Experiencing symptoms from musculoskeletal injuries to the lower extremity
- Any systemic pathology
- Recent surgery
- Participating in weight training for more than three hours per week
- Experiencing DOMS at the time of the test procedure.

4.0 RESULTS

Present study was conducted in Imperial University Lahore, Pakistan from 20 August 2020 to 15 February 2021. Required sample size was 14 but 40 participants were included in the study due to the criteria set by University for RCTs. For between groups' comparison Independent t test was used and for within group comparison paired t test was used. Data was analyzed by using IBM SPSS version 21.0. Descriptive data was reported in form of mean and standard deviation. Normality of data was calculated by Shapiro-Wilk test. Independent t test was used for between group's comparison and paired t test was used for within group comparison. Confidence interval was kept at 95% and a p-value of less than 0.05 was considered significant. After the analysis by applying Shapiro-Wilk test it was found that data was normally distributed, therefore we applied parametric tests for between groups and within group analysis. Data of group A as well as group B (Massage group) were normal as the p-value of all variables were higher than 0.05 which means data is normally distributed.

There was no significant difference (Group-A=0.75±1.119), (Group-B=0.30±7.33) between NPRS scores of both groups (p-0.140). Vertical jump scores (P-0.604) also showed no significant difference where the values of both groups are same (Group-A=14.200±2.0157, Group-B=14.625±3.0257). However, sprint speed scores of both groups were significant (Group A=18.2750±1.48218, Group B=21.3350±2.92774)

There was significant difference (Pre-7.30±1.525), (Post-0.75±1.118) between the pre- and post-intervention data of NPRS scores of Group-A (p-0.001). There was no significant difference (Pre-13.950±2.2178), (Post-14.200±2.0157) between the pre- and post-intervention data of Vertical jump scores of Group-A (p-0.547). There was also no significant difference (Pre-18.0465±1.27538), Post-18.2750±1.48218) between the pre- and post-intervention data of Sprint Speed scores of Group-A (p-0.127).

There was a significant difference (Pre-6.90±1.165), (Post-0.30±.733) between the pre- and post-intervention data of NPRS scores of Group-B (p-0.001). There was a significant difference (Pre-12.550±3.2843), (Post-14.625±3.0257) between the pre- and post-intervention data of Vertical jump scores of Group-B (p-0.001). There was a significant difference (Pre-20.8020±2.80357), Post-21.3350±2.92774) between the pre- and post-intervention data of Sprint Speed scores of Group-B (p-0.037). As there was significant difference at pre-intervention level for sprint speed between both groups so effect size was calculated using Cohen's D statistics. The resulted values (pre-intervention=1.265203, post-intervention=1.318738) were similar in both groups and showed that there was no real difference between the results of both groups.

Table 1: Within group comparison of group A (paired t-test)

Sr. no.	Variable	Mean±SD		p-value
		Pre	Post	
1	NPRS	7.30±1.525	0.75±1.118	0.001
2	Vertical Jump	13.950±2.2178	14.200±2.0157	0.547
3	Sprint Speed	18.0465±1.27538	18.2750±1.48218	0.127

Table 2: Within group comparison of group B (paired t-test)

Sr. no.	Variable	Mean±SD		p-value
		Pre	Post	
1	NPRS	6.90±1.165	0.30±.733	0.001
2	Vertical Jump	12.550±3.2843	14.625±3.0257	0.001
3	Sprint Speed	20.8020±2.80357	21.3350±2.92774	0.037

FIGURES

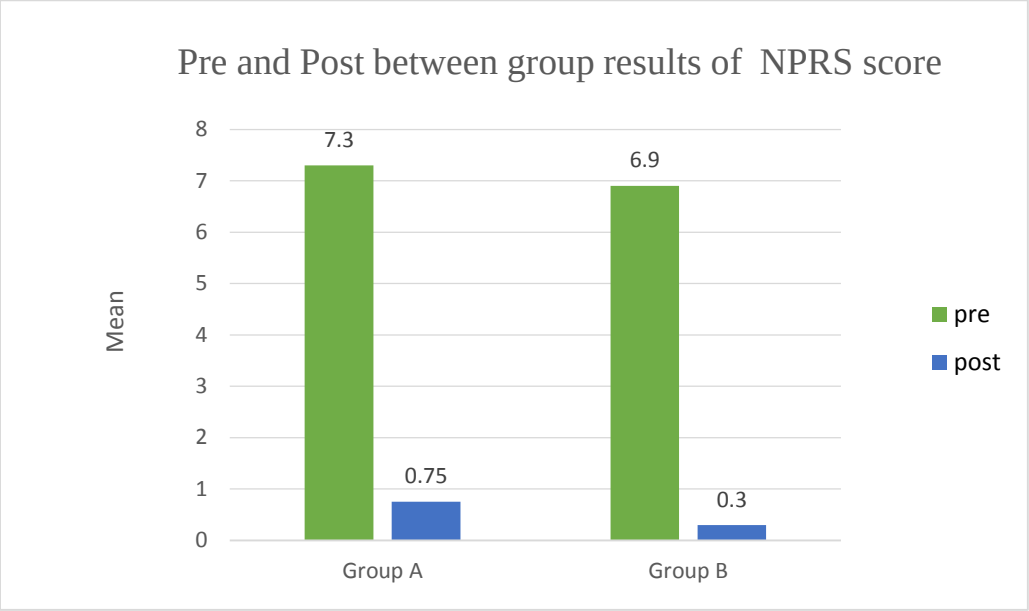

Figure1: Between Group Comparison Pre And Post Intervention NPRS score mean changes.

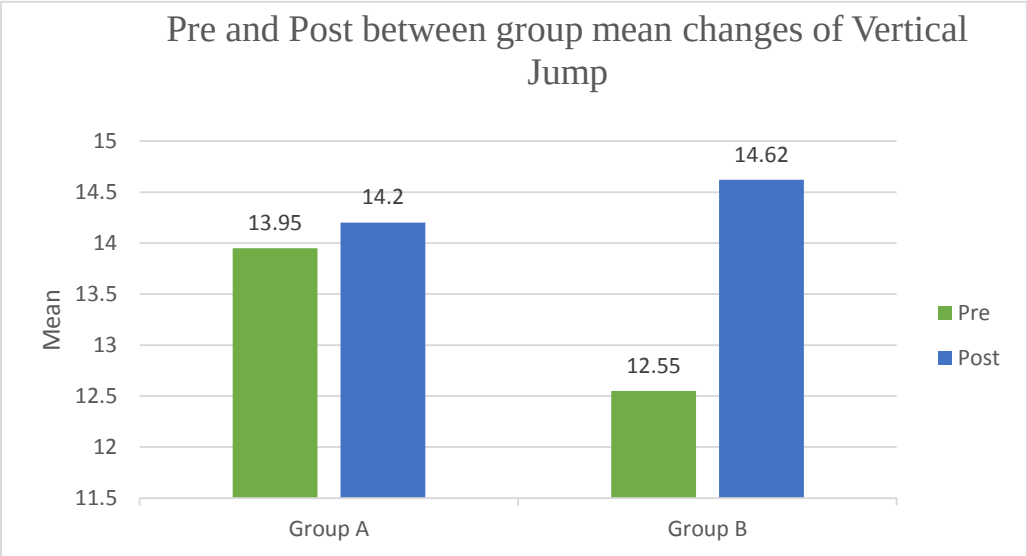

Figure 2: Between Group Comparison Pre And Post Intervention Vertical Jump mean changes.

European Journal of Health Sciences
ISSN 2520-4645 (online)
Vol.6, Issue 2, pp 18-29 2021

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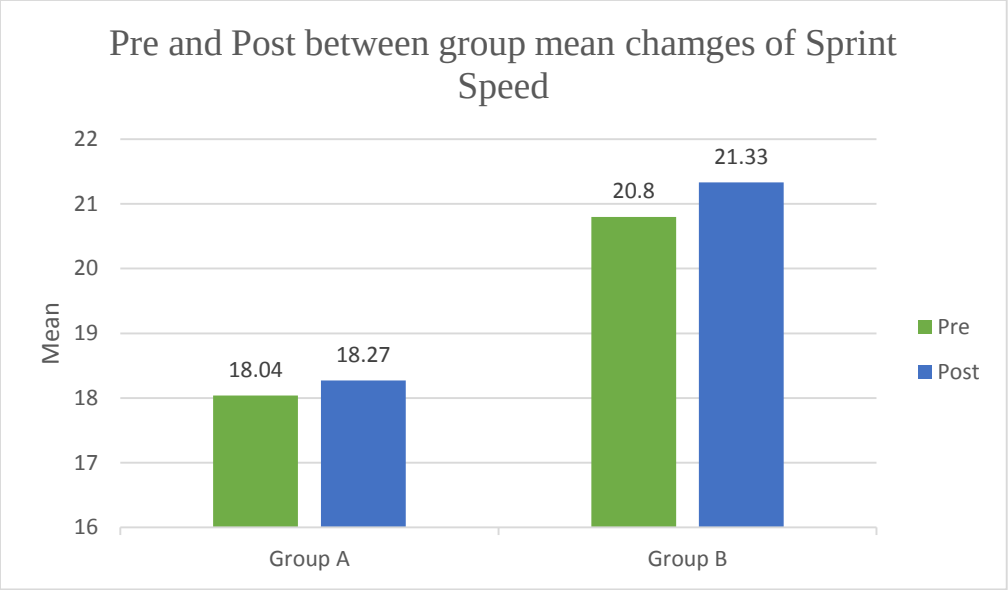

Figure 1: Between Group Comparison Pre And Post Intervention Sprint Speed mean changes.

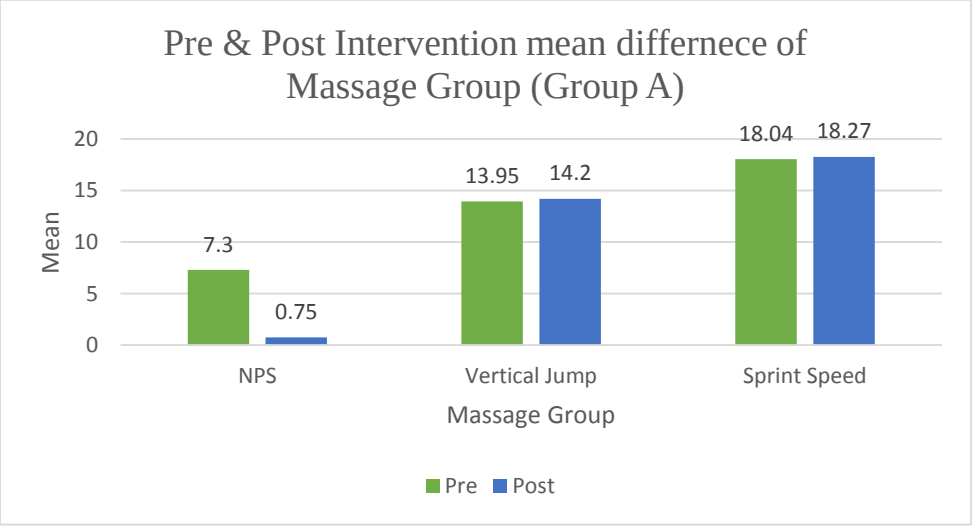

Figure 3: Within group Pre and Post Intervention mean changes of Group A

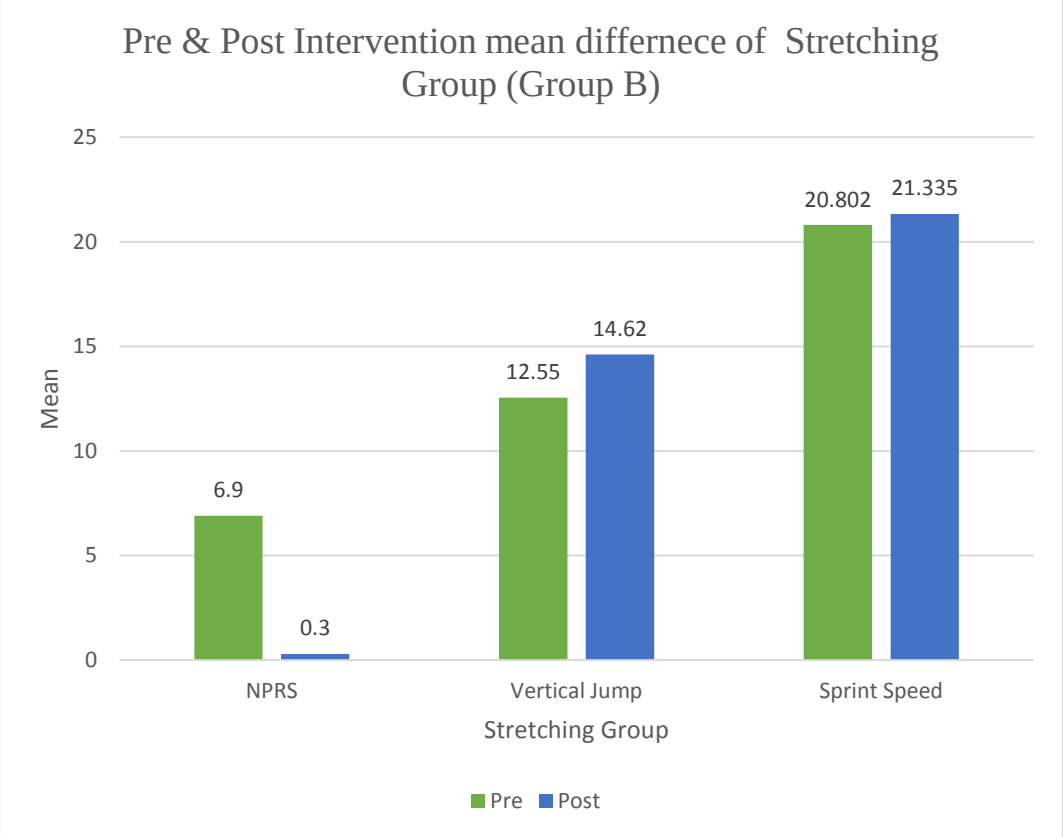

Figure 4: Within group Pre and Post Intervention mean changes of Group B

5.0 SUMMARY

5.1 Summary of Findings

In summary, both massage therapy and passive static stretching shows significant results for reducing delayed onset muscle soreness in the tibialis anterior muscle. Additionally, within group analysis demonstrates passive static stretching shows significant results for improving the vertical jump in the participants. More researches should be done particularly on tibialis anterior muscle to find the results of different therapies.

5.2 Conclusion

Both massage therapy and passive static stretching techniques were found to be effective for reducing the muscle soreness in the tibialis anterior muscle, as well as for improving players' performance. However, within group analysis shows that passive static stretching significantly improves the vertical jump height in the athletes.

5.3 Recommendations

- Further studies should be done on Tibialis Anterior muscle with comparison of different interventions
- Further studies should be conducted on a larger scale of population of athletes nationwide
- Sportsmen and massage therapists can reduce the intensity of DOMS of Tibialis Anterior by applying 10 minutes massage therapy or 80 seconds stretch daily.
- Professional sports teams spends thousands of bucks on equipment to increase the performance of athletes. The current study indicates a potential for therapeutic and performance benefits to the athletes.

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