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Impact Of Progressive Pressure Technique Versus Traditional Physical Therapy In Treatment Of Patients With Lower Back Myofascial Pain Syndrome: A Randomized Clinical Trial

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Abstract

Background: Is a major health problem in modern society. Myofascial pain syndrome is a condition characterized by muscles shortening with increased tone and associated with trigger points that aggravated with activity of daily living. **Objective of the study:** To assess the effect of progressive pressure technique versus traditional physical therapy in treatment of patients with lower back myofascial pain syndrome. **Subjects and Methods:** Thirty patients their age ranged from 18 - 43 years participated in our study and divided randomly into two equal groups suffering from myofascial low back pain. The first group (A) consist of 15 patients receiving progressive pressure technique over trigger points of back muscles followed by stretching exercise, the second group (B) consist of 15 patients receiving traditional physical therapy program (Infrared radiation, ultrasonic, stretching and strengthening exercises for back muscles). The following parameters including pain severity, functional disability and lumbar range of motion (flexion, extension, right side bending and left side bending) were measured before and after treatment. **Results:** The Statistical Package for Social Science (SPSS) software version 23 for Windows was used for all statistical analyses. Covariance homogeneity and data normality are tested using the Box's test and the Shapiro-Wilk test, respectively. 2x 2 mixed design MANOVA was used to compare the tested variables of interest in different test groups and measurement times. The alpha level was set at 0.05. Regarding within group's comparison, it revealed that there was significant increase ($p < 0.05$) in Range of flexion and extension and significant reduction ($p<0.05$) in pain severity, right and left side bending and functional

disability at both groups post- treatment. Regarding between subject effects multiple pairwise comparisons revealed that there was significant difference between both groups pre- treatment and post- treatment in pain severity, functional disability, and back range of motion ($p<0.05$) at post- treatment in favor to group A compared to group B. **Conclusion:** On the basis of the present date, it is possible to conclude that both progressive pressure technique and traditional physical therapy were effective in reducing pain severity and functional disability and improve range of motion in treatment of patients with lower back myofascial pain syndrome. However, progressive pressure technique is more effective than traditional physical therapy in treatment of patients with lower back myofascial pain.

Key words: Acupuncture Dry needle, traditional physical therapy, myofascial pain syndrome.

INTRODUCTION

In today's environment, low back pain (LBP) is a serious health issue. According to one study, the lifetime prevalence of low back pain in individuals is 62%. The mean point frequency among adults was 32%. **[1]** According to experts, at least 10% of persons who suffer from back pain have an underlying neurological disorder. Over 5% of them have definite identifiable causes, whereas the other 5% have no clear recognized etiology. **[2]**

Myofascial Pain Syndrome (MPS) is a disorder defined by persistent and intense pain in the afflicted region, which is coupled with trigger points (TrPs) that are increased by regular activities (ADL)**. [3]**

Myofascial TrPs (MTrPs) are thought to be hyperirritable areas in tight bands of skeletal muscles a unit region comprised of multiple "contraction knots" in muscle fibers. The existence of active MTrPs contributes to the beginning of numerous clinical pain-related diseases due to muscle fiber shortening and increased pressure on veins or nerves around these contraction knots. As a result, several therapies that inactivate or eliminate MTrPs may alleviate persistent myofascial pain. **[4]** TrPs are characterized as active or latent based on clinical features. At rest, an activated trigger point creates discomfort. It is palpably painful with a referred pain pattern comparable to the patient's pain complaint**. [5]** This redirected pain is felt away from the region of the trigger-point origin. Pain is frequently characterized as spreading or radiating. **[6]**

A trigger point's main feature is referred pain. It distinguishes a trigger point from a sensitive point, which causes pain exclusively at the place of palpation. **[7]** A latent trigger point does not induce pain on its own, but it might limit mobility or create muscular weakening. **[8]** Only when pressure is placed directly over a latent trigger point will a patient who is experiencing muscular limitations or weakness become aware of discomfort. **[9]** TrPs inhibits muscular movement and reduces circulation, depleting the muscle of nutrients and oxygen and leading in a buildup of metabolic waste that cannot be filtered away. These wastes both activate and destroy pain nerve endings. The lack of nutrition to the muscles causes spasms and inflammation. **[10]** Trigger-point injection, stretch and spray, dry needling (acupuncture), massage, trigger point pressure release, exercise, and pharmaceutical treatments can all be used to treat myofascial TrPs. **[11]**

The TrPs progressive pressure technique, which is based on the ischemia

compression technique, can give significant pain relief. The therapist delivers direct digital pressure to each myofascial TrP until tension release is achieved, at which point the TrP is deactivated. This treatment is both safe and effective for successfully eliminating myofascial Trps soreness. **[12]** Stretching is beneficial in conjunction with myofascial trigger point pressure release because a myofascial trigger point is successfully deactivated when the muscle in which it is located is returned to its normal resting length.

Myofascial back pain syndrome is linked to TrPs in the iliocostalis lumborum, quadrates lumborum, gluteus medius, and piriformis. **[13]**

Heat treatment has been shown to be useful in easing pain, reducing muscular spasms, and improving disability in patients suffering from acute and chronic low back pain. **[14]** The connective tissues are considered to remold with repeated heat and stretch, enabling normal functioning to be restored. **[15]** The favorable results of topical therapeutic US include reports of increased range of motion and pain reduction. **[16]** Both spinal flexion and spinal extension exercises significantly reduced the severity of chronic mechanical low back pain in individuals. **[13]**

Until now, no research has compared the effects of progressive pressure technique versus traditional physical therapy on pain severity, functional disability, and lumbar range of motion (flexion, extension, right side bending, and left side bending) in patients with lower back myofascial pain syndrome. As a result, this study will be carried out to identify which of the two therapy regimens is more effective in terms of treatment.

Objectives of the study:

The purpose of the study was to compare the effectiveness of progressive pressure technique to standard physical therapy in treating individuals with lower back myofascial pain syndrome.

SUBJECTS AND METHODS

Study Design:

The study was designed as an experimental randomized clinical trial. The study was evaluated and approved by the ethical committee of Faculty Physical Therapy, Cairo University, Egypt, (Approval number: P.T.REC/012/004024). The Helsinki Declaration Criteria for human research were followed in this study. A written informed consent was obtained from each patient.

Subjects:

Thirty patients (male & female) with age between 18-43 years participated in the study. Group (A): consisted of 15 patients receiving progressive pressure technique over trigger points of iliocostalis lumborum, quadrates lumborum, gluteus medius and piriformis muscles followed by stretching exercise. Group (B): consisted of 15 patients receiving traditional physical therapy program (Infrared radiation, ultrasonic, stretching and strengthening exercises for back muscles), were examined for eligibility in the study. Figure (1):

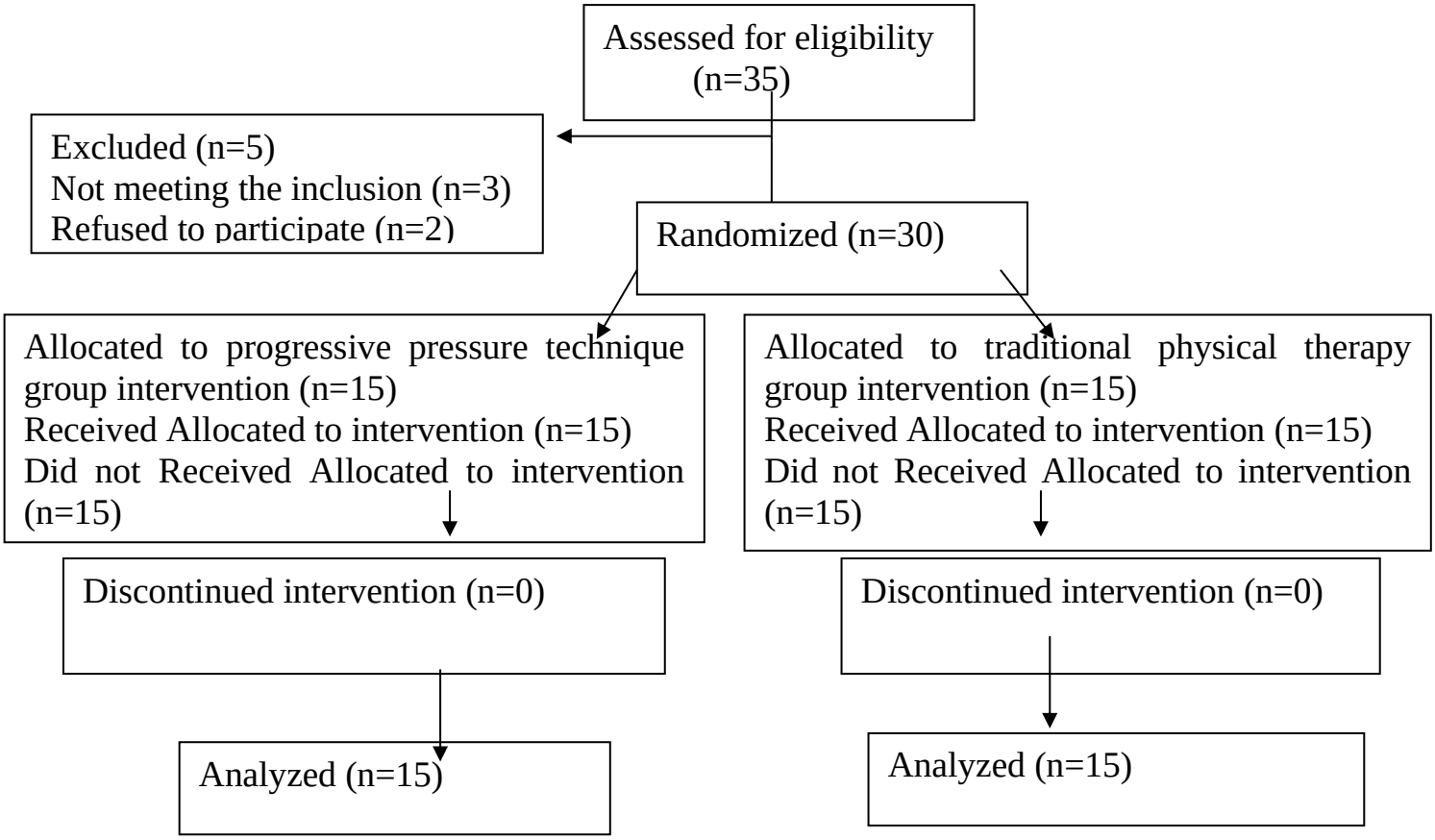

Figure (1): Participant flow diagram

Inclusion Criteria:

- Age ranges from 18 to 43 years old.
- Pain of at least 30 mm to 70 mm on a visual analogue scale (VAS) from 0 mm (no pain) to 100 mm (worst imaginable pain). **[17]**
- Presence of MTrPs at least in 4 muscles on any side.
- Patients had lower back myofascial pain syndrome for at least 3 months ago.

Exclusion Criteria:

History of previous back surgery, neurologic deficit, current lower extremity symptoms, cardiopulmonary disease with decreased activity tolerance, rheumatologic conditions, polyarticular osteoarthritis, rheumatoid arthritis and advanced lumbar degenerative disease, participants receiving other treatment, in the form of physical therapy or medication, for the duration of the study that may interfere with the results of this study.

Randomization and allocation concealment:

Following the fulfillment of all baseline conditions, participants were randomized using the random permuted block technique to guarantee that the treatment groups were balanced at the conclusion of each block. Using random number generator software, participants were divided into blocks. For ethical reasons, all patients were requested to sign a permission form.

Instrumentations:

Assessment Instrumentations:

Patients were assessed before and after treatment sessions. The assessment procedures included the following items.

1- Pain assessment:

The Visual Analog Scale is used to measure pain (VAS). VAS is a continuous data analysis scale that employs a 10 cm line with a 0 at one end (no pain) and a 10 at the other end (worst pain). Patients were asked to mark the line to indicate their level of discomfort. **[18]**

2- Functional disability:

Functional disability of each patient was assessed by Oswestry disability questionnaire (Appendix II). It is valid and reliable tool. It is consists of 10 multiple choice questions for back pain, patient select one sentence out of six that best describe his pain, Higher scores indicated great pain.[Scores (0-20%) minimal disability, Scores(20%- 40%) moderate, Scores (40% - 60%) severe, Scores(60%-80%) crippled, Scores (80% - 100%) patients are confined to bed. **[19]**

3- ROM assessment:

A- Assessment of lumbar flexion and extension:

Modified-modified Based on the work, the Schober flexion method was applied. **[20] .**This method is reliable and valid in measuring range of motion of lumbar flexion.

The investigator stood behind the standing patient, using her or his thumbs to locate the posterior superior iliac spines, and then an ink mark was placed down the midline of the lumbar spine horizontal to the posterior superior iliac spines. The distance between superior and inferior skin markings was measured by making another ink mark 15 cm above the original mark. The patient was then told to bend forward into complete lumbar flexion, at which point the new distance between superior and inferior skin marks was measured.

The patient was then told to bend backward into full extension, and the new distance between superior and inferior skin marks was measured as a straight line. The amount of lumbar extension was determined by the change in the usual difference between markers. This test was repeated three times, and the mean value was used to calculate the lumbar extension range of motion.

B- Lateral flexion:

Lateral flexion was measured as the distance from the tip of the index finger to the floor at maximal comfortable lateral flexion based on the work of **.**The subject was instructed to move as far as possible into lateral flexion. This test was performed for three consecutive times for each side and the mean value for each side was considered as the lateral flexion range of motion.

B- Instrumentation used for treatment:

1. Infrared radiation:

Infrared has been used as a form of heat for many purposes. Its model is 4004/2N. The device has a power of 400w, voltage 203v and frequency of 50/60Hz. Infrared is sometimes chosen as a form of heat prior to stretching, mobilization, traction, massage and exercise therapy.

2. Ultrasonic device:

Ultrasonic device Phyaction 190 serial number 2745, 230V, 300 mA / 50 - 60Hz, Pus : 8w. It is used for pain relief and break down of adhesions in the case of LBP.

Treatment procedure:

1- Treatment procedure for group A (progressive pressure technique):

Once tissue resistance was sensed, sustained mild pressure was administered using the thumb or four fingers for 90 seconds to 120 seconds, advancing inward toward the center of the MTrp; pressure was maintained until resistance dissipated (melting away). This cycle was performed three times, with a 90-second rest interval in between each compression. At the conclusion, either more tissue relaxation will be felt or no further gains will be made. **[21]**

Muscles treated by progressive pressure technique:

1- Iliocostalis lumborum:

Stretching position: long sitting, trunk flexion, reaches with the arm to the opposite side. Ischemic compression was applied from side lying position.

2- Quadrates lumborum:

During trigger point therapy and while the patient is in side lying position, the patient's arm was placed in extension to elevate the rib cage; upper leg is in extension and adduction to drop the iliac crest lower, and use a pillow or bolster under the non-treated side to open up a wider space where trigger points can be easier identified and pressure is applied perpendicular. Stretching position: the patient is in a semi prone position with the leg in extension and adduction. The therapist supports the area of the lower thoracic cage and iliac crest with his hands while spreading the hands apart or in semi supine with the leg in flexion and adduction, the therapist supports the area of the lower thoracic cage and iliac crest with his hands while spreading the hands apart.

3- Gluteus medius:

Stretching position: the patient is in a supine position. The involved side is in hip flexion and adduction. The patient facilitates movement using one hand to assist hip flexion and the other to assist hip adduction. Ischemic compression was applied from side lying position.

4- Piriformis:

Stretching position: the patient is in supine position. The involved side is in hip flexion above 90 degrees, adduction, and external rotation. Emphasis is on external rotation. The patient facilitates movement using both hands and the other leg to assist hip flexion, adduction and external rotation. Ischemic compression was applied from side lying position.

Stretching exercise:

Stretching exercises must always be performed after trigger point therapy to maintain the degree of relaxation and restore the muscle to an ergonomically suitable state. The stretch should be quite gradual and last more than 30 seconds. **[21]** The patients received 2 sessions per week for 2 weeks.

4- Treatment procedure for group B: traditional physical therapy:

There were 15 patients in this group. They got typical physical treatment for 12 sessions spread out over four weeks:

- - Infrared radiation for 20 minutes per session at a distance of 60 cm from the lumbar area, while patients lie prone for 12 sessions per week, every other day for one month. **[22]**
- - Ultrasonic: continuous mode of application 1.5w/cm2 for 5 minutes at 1Hz. **[16]**
- 30 seconds of mild stretching for the hamstring, calf, and back muscles from the lengthy setting. **[13]**
- - Back muscle strengthening exercises (bridging and active back extension). **[23]** At the session, each exercise was performed three times with a six-second pause in between.

Statistical analysis

The Statistical Package for Social Science (SPSS) software version 23 for Windows was used for all statistical analyses. Covariance homogeneity and data normality are tested using the Box's test and the Shapiro-Wilk test, respectively. 2x 2 mixed design MANOVA was used to compare the tested variables of interest in different test groups and measurement times. The alpha level was set at 0.05.

Results

Mixed design MANOVA revealed that there were significant within- subject effect and treatment*time effect (F = 224.929, p = 0.0001, Partial Eta Squared=0.983) (F = 80.283, p = 0.0001*, Partial Eta Squared=0.954) respectively. Also, there was significant between- subject effect (F= 27.429, p = 0.0001*, Partial Eta Squared=0.877). The descriptive statistics of within and between groups differences at 95 % CI for the effects of interventions for all dependent variables were presented in table (1). Concerning to the within subject effect, the multiple pairwise comparison tests was used to compare between pre and post treatment in both groups, and it revealed that there was significant increase ($p < 0.05$) in Range of flexion and extension and significant reduction ($p<0.05$) in pain severity, right and left side bending and functional disability at both groups post-treatment. Regarding between subject effects multiple pairwise comparisons revealed that there was no significant difference between both groups pre-treatment and post- treatment in pain severity, Range of flexion, Extension and in functional disability while there was significant reduction ($p<0.05$) in range right and left side bending at post-treatment in favor to group A compared to group B.

Table (1). Descriptive and Inferential Statistics of the Dependent Variables in the Experimental and Control Groups Pre and Post the Study Period.

		Group (A) (n = 15)	Group (B) (n = 15)	P value*
Pain Severity	Pre training	6.06 ± 1.22	6.13 ± 1.12	0.878 NS
	Post training	3.43± 0.53	3.36 ± 1.90	0.899 NS
	% of change	43.39 ↓↓	45.18 ↓↓	
	P value**	0.001S	0.001S	
Range of Flexion	Pre training	3.7± 0.56	3.7 ± 0.56	1.00 NS

	Post training	6.56 ±0.69	6.76± 0.94	0.514 NS
	% of change	77.29↑↑	82.7 ↑↑	
	P value**	0.001S	0.001S	
Range of Extension	Pre training	1.54 ± 0.24	1.52± 0.24	0.825 NS
	Post training	2.44 ± 0.25	2.32 ± 0.41	0.327 NS
	% of change	58.44 ↑↑	52.63 ↑↑	
	P value**	0.001 S	0.001S	
Range of Right side Bending	Pre training	48.6 ±3.72	48.59 ±3.65	0.992 NS
	Post training	19.45 ± 1.15	44.57 ± 4.78	0.001 S
	% of change	59.97 ↓↓	8.27 ↓↓	
	P value**	0.001S	0.001S	
Range of Left side bending	Pre training	49.21 ± 3.15	49.22 ± 3.18	0.991 NS
	Post training	19.32 ± 0.9	45.05 ± 4.81	0.001 S
	% of change	60.73 ↓↓	8.47 ↓↓	
	P value**	0.001S	0.001S	
Functional Disability	Pre training	47.13 ± 4.15	47.33± 4.16	0.896 NS
	Post training	27.66 ± 2.09	30.73 ± 7.83	0.154 NS
	% of change	41.13 ↓↓	35.07 ↓↓	
	P value**	0.0001S	0.0001S	

DISCUSSION

The findings of this study revealed that both progressive pressure technique and traditional physical therapy were effective in reducing pain severity, functional disability, and back range of motion in patients with lower back myofascial pain syndrome, and that stretching exercise resulted in similar outcomes in patients with myofascial back pain syndrome after treatment. Because physical therapists adopt a multimodal treatment strategy in general, it would be interesting to examine if progressive pressure method or standard physical therapy will provide any further benefit for the management of myofascial back pain.

A. progressive pressure technique group (A)

This finding is consistent with prior studies on the advantages of trigger point release in those suffering from myofascial pain syndrome. Researchers investigated the efficacy of ischemia compression, passive stretching, and the combination of ischemic compression and passive stretching for the

first time and discovered that the combination was far more useful for pain relief than the others. **[21]** The efficacy of ischemia compression was tested on 13 patients with 40 myofascial trigger points and found that ischemic compression was much more beneficial for therapy than the control group, albeit no optimal quantity of ischemic compression was determined. **[24]**

The benefit of combining ischemic compression and stretching on the neck and upper back for people with MPS was studied. Patients were given the combination therapy for 5 days before the length of pain sensations in 24 hours, PPT, and VAS were measured and compared to those measured before treatment. The findings revealed that a home program using ischemia pressure and consistent stretching was effective in decreasing TP sensitivity and pain intensity in people suffering from neck and upper back discomfort. **[25]**

When used in concert with other physical therapy modalities for active upper trapezius trigger points, IC with measured pressure and duration provided rapid pain alleviation and decreased trigger point sensitivity. The improvement in Group A might be attributed to the following mechanisms: The fundamental cause of myofascial trigger point formation and local ischemia at trigger point locations is shortened sarcomeres. As a result of the ischemia compression and stretching, the shortened sarcomeres flatten and expand. When the pressure is released from the trigger point, the actin and myosin overlap decreases, resulting in a flush of blood at the site of compression. This promotes local circulation while decreasing the discharge of poisonous and unpleasant substances. All of this helps to limit trigger point activity and lessen myofascial trigger point sensitivity. **[26]**

Trigger points can be deactivated and muscle spasms minimized by eliminating myofacial restrictions, restoring normal muscle activation and function and so alleviating functional impairment. **[27]** After myofascial therapy, trunk muscle stretching and exercises produce muscular relaxation and pain relief. **[28]** This explanation come in agreement with **Simons (2004)[29]** when he proposed an integrated hypothesis of MTrP etiology in which acute or chronic muscle tension induces motor endplate damage and subsequent acetylcholine release Excess acetylcholine causes contraction knots (areas of localized sarcomere shortening) to form, which continue to contract and induce local ischemia and hypoxia. Because the combination of increased energy demand and decreased energy supply results in the release of sensitizing noxious substances, which are thought to be responsible for the pain associated with MTrPs, treatment of TrPs should focus on equalizing the length of sarcomeres in the involved MTrP and improving circulation in the affected area.

B. Traditional physical therapy program group (B)

According to statistical analysis of pre and post pain assessment values in the Traditional physical therapy program group, there was a substantial decrease in back pain at the conclusion of treatment compared to pretreatment values. Pain alleviation may be linked to standard physical therapy and may be related to: the action of infrared, which has been utilized as a kind of heat for pain treatment, and muscular spasm reduction. An increase in sensory responses via an increase in

endorphins may also impact the pain gate mechanism. **[30]**

- Heat therapy has been shown to be useful in easing pain, reducing muscular spasms, and improving disability in both acute and chronic conditions (LBP)**. [14]**

- Ultrasound raises the pressure threshold produced by pain receptors. After applying ultrasonic, the conduction velocity of big diameter nerve fibers (A beta) increased, whereas the conduction velocity of small diameter nerve fibers (A delta fibers) responsible for pain decreased. **[31]**

It generates considerable tissue heat, which alters the viscoelastic characteristics of connective tissue, allowing it to move and stretch. **[16]**

Stretching exercises for the back muscles and hamstrings assisted those suffering from low back pain reduce pain and increase flexibility. **[32]**

In terms of functional impairment, the typical program group saw a considerable decrease in functional disability after therapy. **[33]**

Increased myoelectric activity after strengthening workouts suggests improved neuromuscular system performance since individuals are capable of consciously recruiting move motor neurons and raising their firing rate **[32].**
This finding also, has been supported by **Johanssen et al., (1995)[34]** They discovered that combining dynamic back and abdominal workouts with stretching exercises was beneficial in lowering functional impairment.
Improve multifidus muscle strength (which atrophy in the low back) and pain relief **[35].**
In terms of lumbar range of motion (flexion, extension, right side bending, and left side bending), statistical analysis of pre and post values revealed a significant increase in lumbar range of motion (flexion, extension, Rt side bending, Lt side bending) at the traditional physical therapy program group. This discovery supported by **Magnsson et al. (1998) [36]** who discovered that after a physical therapy program that included strength and flexibility exercises, functional ability and range of motion of lumbar flexion, extension, lateral right bending, and lateral left bending improved due to increased muscle strength, pain reduction, improved muscle flexibility, and improved motor control skills.
Improved range of motion has been linked to symptom improvement in individuals with persistent back pain following a flexibility program, supporting the discovery of **Battie et al., (1990). [37]**

Greater trunk flexion range of motion following flexion and extension workouts due to increased trunk flexibility and mobility. **[23]**

This was corroborated by the improvement of patients' physical activity, psychological state, and pain alleviation as being responsible for decreased impairment and increased range of motion by **Sullivan et al.,(2000). [38]**

Conclusion

Based on the available data, it is feasible to infer that both progressive pressure method and standard physical therapy were helpful

in treating patients with lower back myofascial pain syndrome in terms of lowering pain severity, functional impairment, and improving range of motion. However, in the treatment of individuals with lower back myofascial pain, the progressive pressure approach outperforms regular physical therapy.

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Ethics Statement:

The study was designed as an experimental randomized clinical trial. The study was examined and approved by the ethical committee of Faculty Physical Therapy, Cairo University, Egypt, (approval number: P.T.REC/012/004024). The Helsinki Declaration Criteria for human research were followed in this study. A written informed consent was obtained from each patient.

Authors Contributions:

AMF, AMY and GMR took part in the concept and design of the study. AMF and AMY contributed to applying each treatment according to the treatment schedule. AMA and SAA participated in acquisition of data. GMR contributed to Data analysis and interpretation. All authors collaborated on the study's statistical analysis, interpretation of the data, writing, and editing.

Disclosure statement:

No authors have any financial interest or received any financial benefit from this research.

Conflict of interest:

Authors state no conflict of interest.

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