

## Original Article

# EFFECTS OF STOTT'S PILATES VERSUS YOGIC EXERCISE IN FIBROMYALGIA PATIENTS: A PILOT STUDY

Ashika Tanna <sup>\*1</sup>, Soumik Basu <sup>2</sup>, Kajal Anadkat <sup>3</sup>.

<sup>\*1</sup> M.P.T. Orthopaedics, YTTC, Assistant Professor, School of Physiotherapy, R.K.University, Tramba, Gujarat, India.

<sup>2</sup> M.P.T. in Sports Sciences, Assistant professor, Department of Physiotherapy, Padmashree Dr. D.Y.Patil Medical College and Research Institute, Pimpri, Pune, India.

<sup>3</sup> M.P.T. Musculoskeletal and Sports Science, Assistant Professor, School of Physiotherapy, R.K.University, Tramba, Gujarat, India.

## ABSTRACT

**Background:** Fibromyalgia Syndrome (FMS) can be defined as a rheumatological condition characterised by chronic widespread pain. A reduced pain threshold as well as hyperalgesia and allodynia. It is a nonarticular painful condition with generalised tender points.

**Purpose:** The aim of this randomised study was to compare the effects of Stott's Pilates versus Yogic exercise on pain, tenderness, pressure threshold, depression & fatigue in Fibromyalgia patients, which is chronic musculoskeletal disorder.

**Methodology:** Female and male (n=20) who had a diagnosis of fibromyalgia syndrome (FMS) according to the American College of Rheumatology criteria were selected from Dr. D.Y.Patil hospital, Physiotherapy department O.P.D. The participants were randomly assigned into 2 groups. In group A, a Pilates exercise program of 1 hour was given by a certified trainer to 10 participants 6 days a week for 4 weeks. In group B, Yoga program of 1 hour was given by certified instructor to 10 participants 6 days a week for 4 weeks. In both groups, pre- (1<sup>st</sup> day) and post treatment (4<sup>th</sup> week) evaluation was performed by VAS (Visual Analogue Scale), TPI (Tender Point Index), AS (Algomeric Score), BDI (Beck Depression Inventory) and FSS (Fatigue Severity Scale).

**Results:** Twenty participants completed the study. In Group A significant difference were observed for VAS, TPI, BDI & FSS (statistically  $p < 0.05$ ) and in Group B significant difference were observed for VAS, TPI, AS, BDI & FSS (statistically  $p < 0.05$ ). But between group comparison result was not supports the within group differences (statistically  $p > 0.05$ ).

**Conclusion:** Hence, we suggest Pilates exercise and Yoga both are equally effective in treating fibromyalgia patients.

**KEY WORDS:** Fibromyalgia, Pressure Algometer, Stott's Pilates, Yoga.

**Address for correspondence:** Dr. Ashika Tanna, M.P.T. Orthopaedics, YTTC, Assistant Professor, School of Physiotherapy, R.K.University, Tramba, Gujarat, India. Contact No. +91-9978469090

**E-Mail:** [ashika.tanna@rku.ac.in](mailto:ashika.tanna@rku.ac.in) / [dr.ashikatanna89@gmail.com](mailto:dr.ashikatanna89@gmail.com)

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## INTRODUCTION

Fibromyalgia Syndrome (FMS) is a common rheumatological condition characterised by chronic widespread musculoskeletal pain and a reduced pain threshold as well as hyperalgesia

and allodynia. It is an idiopathic, nonarticular pain syndrome presenting with generalised tender points. It is a multisystem and multifactorial disease characterised by sleep disturbance, fatigue, headache, morning

stiffness, paresthesias, anxiety, depression and some other psychological symptoms [1,2]. In the most of cases of fibromyalgia, the causes are unknown. Physical injuries, emotional trauma, or viral infections may trigger the disorder, but no one trigger has proven to be a cause of primary fibromyalgia. The etiology and bio pathophysiological mechanisms of FMS are not completely understood still. It is a complex disorder with considerable variations in clinical symptoms among patients. Several mechanisms such as peripheral & central hypersensitivity at spinal or brainstem level, brain chemical and hormonal abnormalities, muscle abnormalities, altered pain perception and somatosensation have been hypothesised in various studies [3,4]. Treatment is usually symptomatic because of lack of understanding of etiology and pathogenesis. A range of pharmacological and non-pharmacological management is useful according to evidence based guidelines and reviews.

Exercise programs were reported to be helpful in FMS patients in several studies. Such exercises includes stretching, strengthening, flexibility, aerobic exercises, yoga, tai chi etc..

Pilates is a particular exercise approach that was founded by Joseph Pilates (1880–1967) and was initially practiced by athletes and dancers. Pilates training is intended to improve general body flexibility and health by emphasizing “core” (truncal) strength, posture, and coordination of breathing with movement. Pilates exercises are designed to put participants in a position that minimizes unnecessary muscle recruitment, which could potentially lead to early fatigue, decreased stability, and impaired recovery.

Pilates exercises mainly focusing on back extensors and the abdominal musculature, in particular the transversus abdominis, is referred to as core strengthening. The goal of core strengthening without straining peripheral joints is realized through concentrating on (1) coordinating breathing with movement; (2) scapular, pelvic, and rib cage stabilization during abdominal movements; and (3) head and cervical spine placement to avoid neck strain. As the participant develops improved strength and form, the base of support is gradually reduced to retrain proprioceptive mechanisms while

fostering more efficient movement patterns. This is similar in principle to the dynamic stabilization exercises widely used in the treatment and prevention of musculoskeletal low back pain (LBP), which advocates promoting efficiency of deep stabilizers and decreasing contraction of muscles counterproductive to the activity [3].

Stott Pilates is a version of the Pilates method of physical exercise. It was developed by Lindsay and Moira Merrithew. The most significant difference between Stott Pilates and Joseph Pilates's (which was original method of the early 1900s) is that, where the original method uses a straight spine during exercise, Stott Pilates focuses on maintaining the natural curvature of the spine.

“Yoga” derives from the Sanskrit word ‘yukti’ meaning “union,” aiming to unify spirit (consciousness) with super spirit (God). Yoga is one of the six systems of Indian Vedic philosophy (Darshan). Maharishi Patanjali, rightly known as the “Father of Yoga,” compiled and refined various aspects of yoga systematically in his “Yoga Sutras” (aphorisms), wherein he advocated the eight-fold path known as “Ashtanga Yoga” for an all-around development of human personality. These include - Yama [moral codes], Niyama [self-purification and study], Asana [posture], Pranayama [breath control], Pratyahara [sense control], Dharana [concentration], Dhyana [meditation], and Samadhi [super contemplation]. These are formulated on the basis of multifarious psychological understanding of human personality [4,5].

The strongest evidence in both quality and quantity suggests yoga has a positive impact on hormone regulation. Salivary levels of cortisol have been measured and notably decreased in FMS patients in numerous reviews and trials [6-9]. Yoga leads to increased cortisol is associated with decreasing perceived stress, decreasing anxiety, increasing feelings of well-being and improving pain management [10,11] and higher levels of melatonin to improve immunity and sleep quality [12,13] are other potential effects of yoga practice. Although individual asana and pranayam practices can selectively affect sympathetic or parasympathetic nervous system, the overall effect of yoga practice is to bring a

state of parasympathetic dominance. Sympathetic activity decreased after yoga based guided relaxation. Vijayalakshmi et al (2004) studied that after 4 weeks of supervised yoga training, there was optimization of sympathetic response and restoration of autonomic regulatory reflex mechanisms.

EEG studies show that yoga and meditation practice lead to increase in alpha rhythm, inter-hemispheric coherence & homogeneity in the brain. On the night following yoga, the percentage of slow wave sleep was significantly higher, whereas the percentage of rapid eye-movement sleep and the number of awakenings per hour were less. Following this, the self rating of sleep based on visual analog scales showed an increase in the feeling that the sleep was refreshing, an increase in feeling "good" in the morning, an overall increase in sleep duration [14].

## MATERIALS AND METHODS

**Participants:** A total of 20 subjects who fulfill the ACR 1990 Criteria, were participated in this study. Subjects were recruited from Dr. D. Y. Patil Orthopedic department, Physiotherapy OPD. All subjects met the following inclusion criteria: (1) Pain >3months (2) 11 tender points out of 18points over anatomical sites (3) Pressure threshold <3kg/cm<sup>2</sup> (4) Both male and female patients within the age group of 20-50 years. Subjects were excluded with following exclusion criteria: (1) cardiac disease (2) vascular disease (3) spine pathology (4) joint pathology. All subjects were required to sign the written informed consent document approved by the ethical committee at Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune, India.

**Study Design:** This study was an RCT, was completed in a month period. Recruitment began on 20th of September 2012, and the study was completed by 3rd of November 2012. Twenty subjects were randomly allocated to two groups by the investigator who was involved in data collection, treatment implication, and data analysis. 26 Fibromyalgia subjects were targeted, out of which 20 were included for the study purpose. Subjects in group A received Pilates exercises.

While, subject in group B received Yoga; both

the groups received this protocol for a period of one month, with a frequency of 6 times in a week. Baseline assessments were done after randomization, at the start of the protocol 1st day and at the end of 4 weeks. For each subject, all assessment sessions were performed at the same time of day.

**Assessment:** VAS (Visual analogue scale), TPI (Tender point index), AS (Algometric score), BDI (Beck depression inventory) and FSS (Fatigue severity scale) assessed at baseline & at the end of 4 weeks.

**Rehabilitation programme:** The rehabilitation program consisted of 24 sessions, each session was 1 hour long, 6 times weekly for 4 weeks. All treatment sessions occurred at the same time of day on the same 6 days of the week throughout the study. Intervention was conducted individually and not in a group format. The physical therapist was involved in performing the intervention as well as conducting the assessments. Pilates exercises given to group A patients. There were 10 sets of exercises of which few trial sessions were given before starting the treatment protocol for core muscle activation. Subjects were given warm up (general mobility exercises) for 7-8min, then pilates exercises were given, each for 5 reps and then cool down (stretching exercises) were given for 7-8 min.

Yoga given to group B patients and there were 10 alternating supine, prone and sitting poses chosen. Subjects were given warm up (general mobility exercises) for 7-8min, then yoga poses were given, each for 5 reps and then cool down (stretching exercises) were given for 7-8 min. There is evidence in the literature to support each of the components contained in the intervention.

### Outcome measures:

**Visual Analogue Scale (VAS) [15]:** Mechanical version of a VAS (a tool with a 10-cm ruler and a marker that the patient moves to the point indicating his or her intensity of pain) used by patients.

Scoring: 0 = No pain; 10 = Severe pain

**Tender Point Index (TPI) [16]:** Calculating the Tender Point Index, Apply 4 kg of pressure to each tender point, Observe body language,

**GROUP A - STOTT'S PILATES EXERCISE**



Bilateral leg lift in supine



Bridging with swiss ball



Neck extension with fore-arm supp prone



Heel slides with swiss ball



Shoulder & trunk roll with swiss ball



Shoulder & trunk flexion with ball



Alternate arm lifting with swiss ball



Knee extension with swiss ball



Rowing on swiss ball



Chest hold & arm lifting in supine

**GROUP B - YOGA**



Urdhva dhanurasana



Setubandhasana



Utthisthashta Merudand- asana



Uttanpadasana



Dhanurasana



Naukasana



Bhujangasana



Dandasana



Yogamudrasana



Paschimottasana

especially face, for response, Use the following scale to quantify each response:

Not painful = 0

Felt painful, no physical response = 1

Felt painful, wince or withdrawal = 2

Felt painful, exaggerated withdrawal = 3

Area too painful to allow pressure = 4

Add the tenderness severities for all 18 sites: The sum is the Tender Point Index (TPI)

The expected range for normal controls = 0-5

The expected range for fibromyalgia = 11-72

**Algometric Score (AS) [17]:** The foot pad of an algometer is placed vertically on the skin of area to be tested and consistently at a rate of 1kg/sec. The subject is advised to say "now" when the pressure makes the expected transition from pressure to pain. Immediately the examiner withdraw the instrument and read from the gauge the maximum amount of pressure achieved. Each of anatomical tender points should then be examined and the sum of values obtained from the 18 ACR Criteria designated tender points is divided by 18 to obtain AS. AS will be inversely proportional to the TPI.

**Beck Depression Inventory (BDI) [18]:** It is a widely utilized 21-item self-report scale in both clinical and research studies (Beck et al., 1996).

Interpretation of BDI:

1-10 - These ups and down are considered normal

11-16 - mild mood depression

17-20 - borderline clinical depression

21-30 - moderate depression

31-40 - severe depression

>40 - extreme depression

**Fatigue Severity Scale (FSS) [19]:** There are 9 questions in FSS. Patients are instructed to choose a number from 1 to 7 that indicates their degree of agreement with each statement where 1 indicates strongly disagree and 7, strongly agree. [Krupp et al, Arch Neurol 1989] The scoring is done by calculating the average response to the questions (adding up all the answers and dividing by nine).

**Statistical Analysis:** Differences in data were analysed by using Primer software under the

supervision of biostatistician staff. For within group improvement in Visual Analogue Scale (VAS), Tender Point Index (TPI), Algometric Score (AS), Beck Depression Inventory (BDI) & Fatigue Severity Scale (FSS), Paired t-test was used.

Between group improvement in Visual Analogue Scale(VAS), Tender Point Index (TPI), Algometric Score (AS), Beck Depression Inventory (BDI) & Fatigue Severity Scale (FSS), Unpaired t-test was used.

## RESULTS AND TABLES

The finding of present study clinically supports our alternative hypothesis which was Stott's Pilates exercises(Group A) is more effective than Yoga (Group B) in fibromyalgia patients. Our result reveal significant improvements in VAS, TPI, AS, BDI & FSS in both groups. No significant differences between groups were found in VAS, TPI, AS, BDI & FSS. The within group analysis did not support the between group difference.

**Table 1:** Pre-treatment data for both groups.

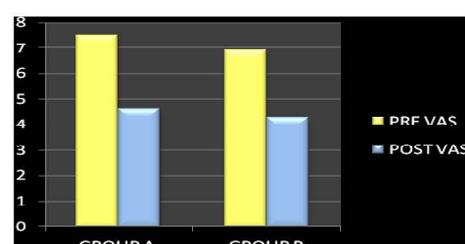
	Group A		Group B	
	Mean	SD	Mean	SD
VAS	7.5	0.849	6.9	0.948
TPI	34.7	8.994	29.5	4.483
AS	20.04	2.223	17.37	5.633
BDI	10.4	2.066	12.3	0.7379
FSS	4.718	0.6749	4.14	0.4904

**Table 2:** Post treatment data for both groups.

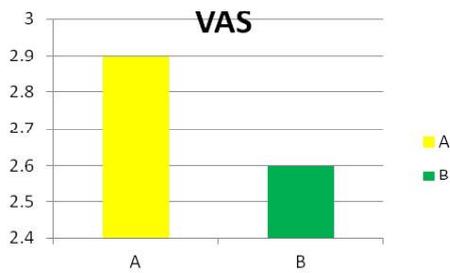
	Group A			Group B		
	Mean	SD	p	Mean	SD	p
VAS	4.6	2.011	0.001	4.3	0.948	0.000
TPI	18.5	5.148	0.000	16.1	4.483	0.000
AS	24.88	6.179	0.058	22.36	5.633	0.000
BDI	6.9	1.197	0.000	6.1	0.7379	0.000
FSS	3.272	0.6158	0.000	2.862	0.4904	0.000

Graphs representing distribution of between group comparison of VAS, TPI, AS, BDI and FSS score respectively.

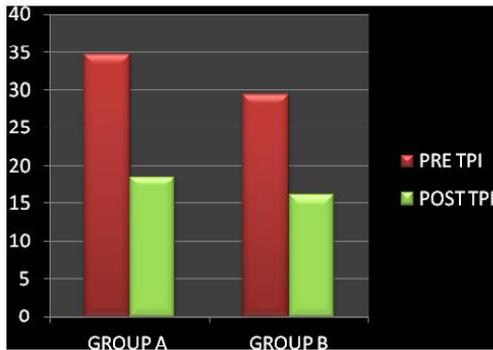
**Graph 1:** Pre and Post treatment comparison of VAS in Group A and B.



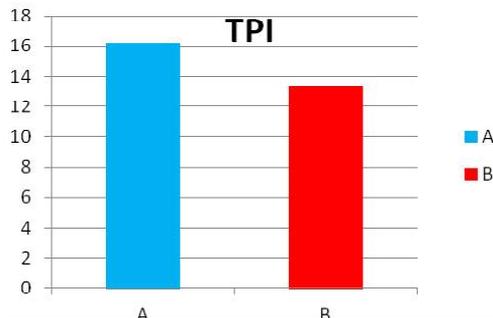
**Graph 2:** Pre and post treatment mean difference comparison of VAS in both groups.



**Graph 3:** Pre and Post treatment comparison of TPI in Group A and B.



**Graph 4:** Pre And Post Treatment Mean Difference Comparison Of TPI In Both Groups.



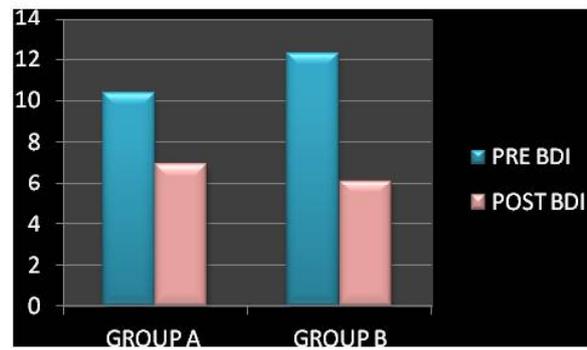
**Graph 5:** Pre and Post treatment comparison of AS in Group A and B.



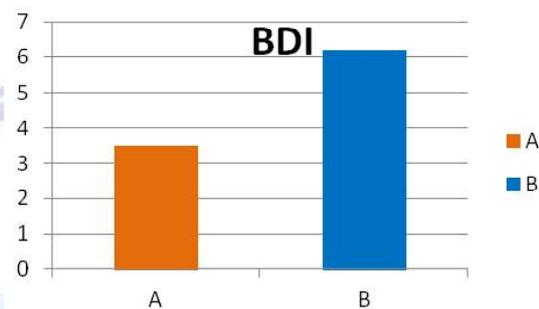
**Graph 6:** Pre and post treatment mean difference comparison of AS in both groups.



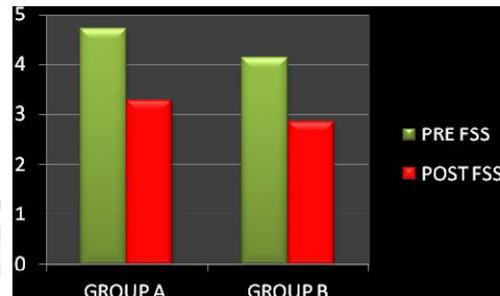
**Graph 7:** Pre and Post treatment comparison of BDI in Group A and B



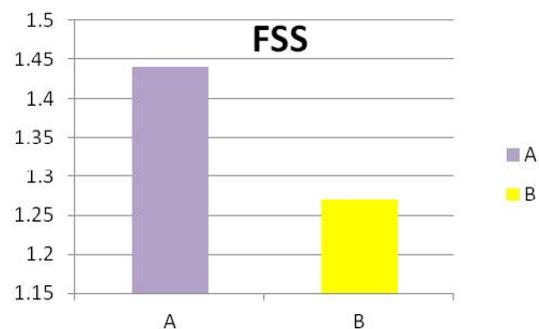
**Graph 8:** Pre and post treatment mean difference comparison of BDI in both groups.



**Graph 9:** Pre and Post treatment comparison of FSS in Group A and B.



**Graph 10:** Pre and post treatment mean difference comparison of FSS in both groups.



## DISCUSSION

Our study shows that both the treatment had effect on improving VAS, TPI, AS, BDI & FSS but statistically there was no difference existed between both the groups at the end of 4 weeks. The mechanisms responsible for the analgesic

effect of exercise are not clearly understood [20]. Although it is a widely accepted hypothesis that activation of the endogenous opioid system during exercise plays a key role in the analgesic response mechanism, several researchers have also suggested a multiple analgesic system including non opioid mechanisms mediated by other substances such as growth hormone and corticotrophin [20,21]. Analgesic effect of exercise may also help to break the vicious cycle of pain-immobility-pain by encouraging the patients to participate in the exercise programs. Exercise may also increase the well-being of patients by preventing muscular hypoxia which is commonly seen in FMS patients [22].

Study has shown that FMS patients have muscular asymmetry and antalgic postural problems (Jones, et al) showed that FMS may affect peripheral and/or central mechanisms of postural control leading to significantly impaired balance. The efficacy of Pilates exercise on fibromyalgia in this study can explain by, Pilates involves close kinetic chain exercises, which provide the compressive and decompressive forces necessary to foster nutrition to the joints and cartilage to reduce risk of degenerative changes and also helps to reduce chronic axial musculoskeletal pain [23].

Several Scientific studies on yoga demonstrate that yoga improves dexterity, strength and musculoskeletal coordination of the practitioners. Postures assumed during yoga practice are mainly isometric exercises which provide optimally maintained stretch to the muscles. Series of asanas involve assumption of the pose followed by counterpose i.e. it involves co-ordinated action of synergistic and antagonistic muscles which brings increased steadiness, strength, stamina, flexibility, endurance, anaerobic power, better neuro-muscular coordination and improved orthostatic tolerance [14].

Study limitation was that it was conducted with small size of Fibromyalgia patients, hence there is limited generalizability of findings to population of people with Fibromyalgia Syndrome as a whole. Instead of receiving bout of exercises and yoga for a shorter period, they may need to continue the programme for several more months for better improvement.

We believe that further research with more participants and longer follow up periods could help to assess the therapeutic value of these exercises. The frequency, duration of exercises in both the groups can be alter to check the effectiveness of treatment. Other outcome measure can be added to see the effect on ADL, strength and endurance.

## CONCLUSION

Here, it can showed that Stott's Pilates exercises and Yoga both are equally effective in treating Fibromyalgia patients statistically but, clinically Stott's Pilates exercises (Group A) showing better improvement than Yoga (Group B).

## ABBREVIATIONS

**FMS** - Fibromyalgia Syndrome  
**VAS** - Visual Analogue Scale  
**AS** - Algometric Score  
**TPI** - Tender point Index  
**FSS** - Fatigue Severity Scale  
**BDI** - Beck Depression Inventory

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**Conflicts of interest:** None

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