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.

METHOD: 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- (1st day) and post treatment (4th week) evaluation was performed by VAS (Visual Analogue Scale), TPI (Tender Point Index), AS (Algometric 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.

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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
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 improved 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/cm² (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. 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. 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
- Uttithastha Merudandasana
- Uttanpadasana
- Dhanurasana
- Naukasana
- Bhujangasana
- Dandasana
- Yogamudrasana
- Paschimottanasana
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.

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th></th>
<th>Group B</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>VAS</td>
<td>7.5</td>
<td>0.849</td>
<td>6.9</td>
<td>0.948</td>
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<tr>
<td>TPI</td>
<td>34.7</td>
<td>8.994</td>
<td>29.5</td>
<td>4.483</td>
</tr>
<tr>
<td>AS</td>
<td>20.04</td>
<td>2.223</td>
<td>17.37</td>
<td>5.633</td>
</tr>
<tr>
<td>BDI</td>
<td>10.4</td>
<td>2.066</td>
<td>12.3</td>
<td>0.7379</td>
</tr>
<tr>
<td>FSS</td>
<td>4.718</td>
<td>0.6749</td>
<td>4.14</td>
<td>0.4904</td>
</tr>
</tbody>
</table>

Table 2: Post treatment data for both groups.

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th></th>
<th>Group B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>p</td>
<td>Mean</td>
</tr>
<tr>
<td>VAS</td>
<td>4.6</td>
<td>2.011</td>
<td>0.001</td>
<td>4.3</td>
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<tr>
<td>TPI</td>
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<td>5.148</td>
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<td>AS</td>
<td>24.88</td>
<td>6.179</td>
<td>0.058</td>
<td>22.36</td>
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<tr>
<td>BDI</td>
<td>6.9</td>
<td>1.197</td>
<td>0.000</td>
<td>6.1</td>
</tr>
<tr>
<td>FSS</td>
<td>3.272</td>
<td>0.6158</td>
<td>0.000</td>
<td>2.862</td>
</tr>
</tbody>
</table>

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.
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

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.
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

REFERENCES