



COMPARATIVE STUDY OF PILATES EXERCISE VERSES YOGASANA IN THE TREATMENT OF FIBROMYALGIA SYNDROME: A PILOT STUDY

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ABSTRACT

Fibromyalgia is a chronic musculoskeletal condition characterised by widespread musculoskeletal pain, fatigue, tenderness, sleep disturbance and depression. According to the National Fibromyalgia Association, "Fibromyalgia, which has also been referred to as fibromyositis and fibrositis. Signs and symptoms includes pain widespread, chronic in nature, many tender points, disturbance of sleep, psychological distress and fatigue." 20 male and female diagnosed of fibromyalgia syndrome (FMS) according to ACR criteria was selected and were randomly assigned into 2 groups. In group A Pilates given to 10 patients. In group B yogasanas given to 10 patients. Both groups were treated daily for 4 weeks. In both groups, Pre (1st day) and post treatment (28th day) evaluation was performed by VAS, TPI, AS, BDI and FSS scales. At the end of the study both the groups showed improvement in pain and fatigue level equally statistically. But clinically group A showed better improvement than group B.

KEY WORDS: Fibromyalgia, Pilates, Yogasanas, ACR criteria



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INTRODUCTION

Fibromyalgia Syndrome (FMS) is a common rheumatological condition characterised by chronic widespread pain and a reduced pain threshold, hyperalgesia and allodynia.² It is an idiopathic, chronic, nonarticular pain syndrome with generalised tender points. It is a multisystem disease characterised by sleep disturbance, fatigue, headache, morning stiffness, paraesthesia, anxiety, depression.^{1,2} It is a complex and multifactorial disorder with considerable variations 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^{3,4,7}. 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. It is focussed on back extensors and the abdominal musculature, strengthening 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.³ Yoga is the integration and harmony between thoughts, words and deeds or integration between head, heart and hands. Patanjali defined yoga as 'Complete control over the different patterns or modifications of consciousness. Salivary levels of cortisol have been measured and notably decreased in FMS patients in numerous reviews and trials.^{4,5,6,7,8,9} 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. 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

METHODS

A total of 20 subjects who fulfil the ACR Criteria, were participated in this study. Subjects were recruited from Dr.D.Y.Patil Medical College and Hospital & Sassoon Hospital, Pune. All subjects met the following inclusion criteria: Pain >3months, 11 tender points out of 18 points over anatomical sites, Pressure threshold <3kg/cm², Both male and female patients within the age group of 20-50 years. Subjects were excluded with following exclusion criteria: cardiac disease, vascular disease, spine pathology, joint pathology. All subjects were required to sign and written informed consent document approved by the sub-ethical committee at Padmashree Dr.D.Y.Patil College of Physiotherapy, Dr. D. Y. Patil Vidyapeeth, Pune. Twenty subjects were randomly allocated in two groups. 20 Fibromyalgia subjects were taken. Subjects in group A received Pilates exercises and in group B received Yoga for 24 sessions in a month, 6 times a week, 1 hourly. Assessments were done on day 1 pre-treatment, and at the end of 4th week post-treatment. Outcome measures were VAS¹⁵ (Visual analogue scale), TPI¹⁶ (Tender point index), AS¹⁷ (Algomeric score), BDI¹⁸ (Beck depression inventory) and FSS¹⁹ (Fatigue severity scale). Group A received 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 exs) for 7-8min, then pilates exercises were given, each for 5 reps and then cool down (stretching exs) were given for 7-8 min. For group B, 20 alternating supine, prone and sitting poses chosen. Subjects were given warm up (general mobility exs) for 7-8min, then yoga poses were given, each for 5 reps and then

cool down (stretching exs) were given for 7-8 min.

RESULTS

Data was analysed by using Primer software and normality distribution done by Epi Info 7 software and MS Excel 2007. The statistical test used for the analysis of the result was:

- 1) Paired t-test.
- 2) Unpaired t-test.

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.

TABLE 1
DEMOGRAPHIC REPRESENTATION OF GENDER IN GROUP A AND GROUP B

SEX	GROUP A	GROUP B
MALE	2	3
FEMALE	8	7

GRAPH 1
DEMOGRAPHIC REPRESENTATION OF GENDER IN GROUP A AND GROUP B

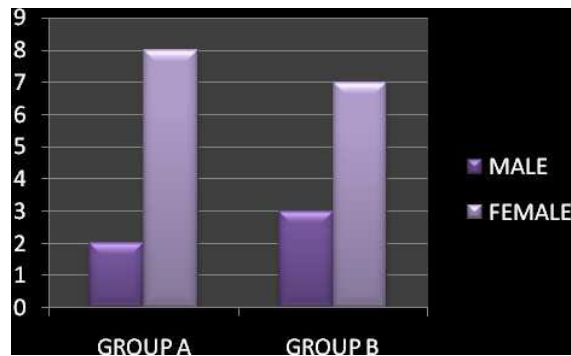


TABLE 2
DEMOGRAPHIC REPRESENTATION OF AGE IN GROUP A AND GROUP B

AGE	GROUP A	GROUP B
20-25	1	1
26-30	0	3
31-35	0	0
36-40	1	0
41-45	1	4
46-50	7	2

GRAPH 2
DEMOGRAPHIC REPRESENTATION OF AGE IN GROUP A AND GROUP B

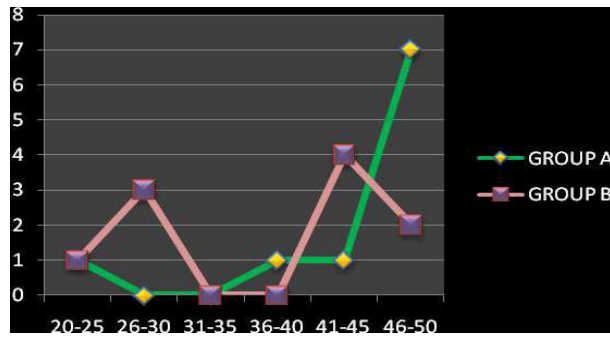


TABLE 3
COMPARISON OF PRE AND POST TREATMENT VAS SCORE OF GROUP A & GROUP B

VAS	Group A			Group B		
	Mean	StdDev	p	Mean	StdDev	p
Pre treatment	7.5	0.8498	0.001	6.9	0.8256	0.000
Post treatment	4.6	2.011		4.3	0.9487	
Difference	2.9	2.025		2.6	1.075	

Table 3 Group A shows there is a significant increase in the mean value of Visual analogue scale post training with $p = 0.001$. This suggest that pilates exercise is effective in improving pain in FMS (95%confidence interval for difference: 1.452 to 4.348). Group B shows there is significant increase in the mean value of visual analogue scale score post training with $p = 0.000$.This suggest that yoga is effective in improving pain in FMS (95%confidence interval for difference: 1.831 to 3.369).

GRAPH 3
COMPARISON OF PRE AND POST TRAINING VISUAL ANALOGUE SCALE OF GROUP A & GROUP B

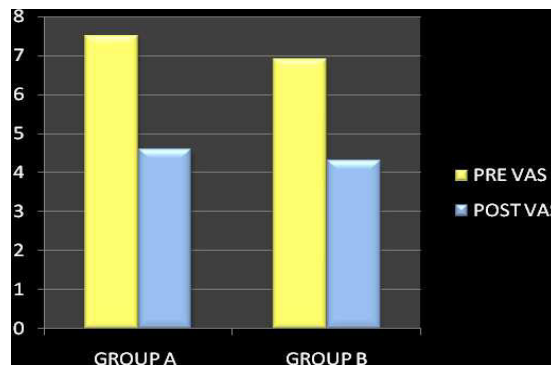


TABLE 4
COMPARISON OF MEAN DIFFERENCE OF VISUAL ANALOGUE SCALE SCORE OF GROUP A AND GROUP B

	Mean	StdDev	P
Pre treatment	2.9	2.025	0.654
Post treatment	2.6	1.075	
Difference	0.3		

Mean difference of VAS between group - A and group - B was not statistically significant (95% confidence interval for difference: -1.223 to 1.823).

GRAPH 4
COMPARISON OF MEAN DIFFERENCE OF VISUAL ANALOGUE SCALE OF GROUP A AND GROUP B

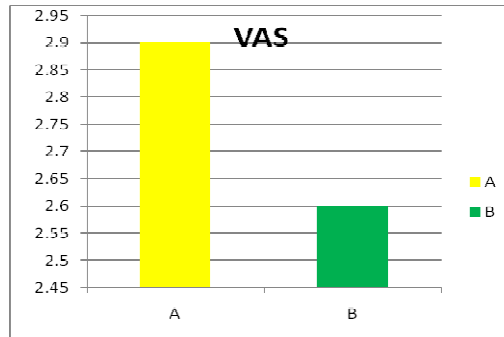


TABLE 5
COMPARISON OF PRE AND POST TREATMENT TENDER POINT INDEX OF GROUP A & GROUP B

	Group A			Group B		
	Mean	StdDev	p	Mean	StdDev	P
Pre treatment	34.7	8.994	0.000	29.5	5.442	0.000
Post treatment	18.5	5.148		16.1	4.483	
Difference	16.2	5.16		13.4	2.066	

Table 5 Group A shows there is significant increase in the mean value of Tender point index post training with $p = 0.000$. This suggest that pilates exercise is effective in improving pain in FMS patients (95%confidence interval for difference: 12.51 to 19.89). Group B shows there is significant increase in the mean value of Tender point index score post training with $p=0.000$.This suggest that yoga is effective in improving pain in Fibromyalgia patients (95%confidence interval for difference: 11.92 to 14.88).

GRAPH 5
COMPARISON OF MEAN DIFFERENCE OF TENDER POINT INDEX OF GROUP A AND GROUP B

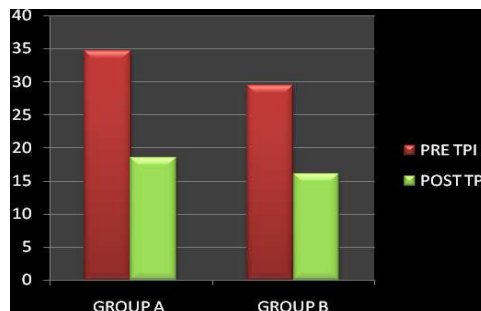


TABLE 6
COMPARISON OF MEAN DIFFERENCE OF TENDER POINT INDEX SCALE SCORE OF GROUP A AND GROUP B

	Mean	StdDev	P
Pre treatment	16.2	5.16	0.129
Post treatment	13.4	2.066	
Difference	2.8		

Mean difference of TPI between group – A and group – B was not statistically significant (95% confidence interval for difference: -0.8924 to 6.492).

GRAPH 6
COMPARISON OF MEAN DIFFERENCE OF TENDER POINT INDEX SCALE OF GROUP A AND GROUP B

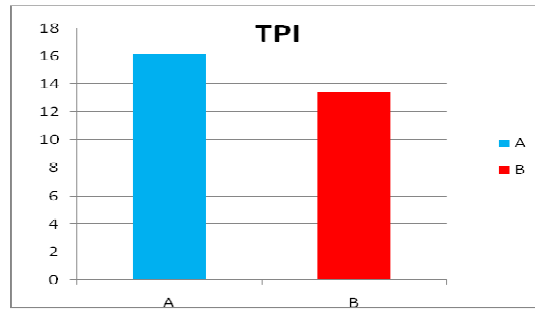


TABLE 7
COMPARISON OF PRE AND POST TREATMENT ALGOMETRIC SCORE OF GROUP A & GROUP B

	Group A			Group B		
	Mean	StdDev	p	Mean	StdDev	p
Pre treatment	20.04	2.223	0.058	17.37	3.927	0.000
Post treatment	24.88	6.179		22.36	5.633	
Difference	-4.84	7.042		-4.99	4.307	

Table 7 Group A shows there is significant increase in the mean value of Algometric score post training with $p = 0.058$. This suggest that pilates exercise is not effective in improving algometric score in FMS (95%confidence interval for difference: -9.878 to 0.1976). Group B shows there is significant increase in the mean value of algometric score post training with $p = 0.000$.This suggest that yoga is effective in improving algometric score in FMS patients (95%confidence interval for difference: -8.071 to -1.909).

GRAPH 7
COMPARISON OF MEAN DIFFERENCE OF ALGOMETRIC SCORE OF GROUP A AND GROUP B

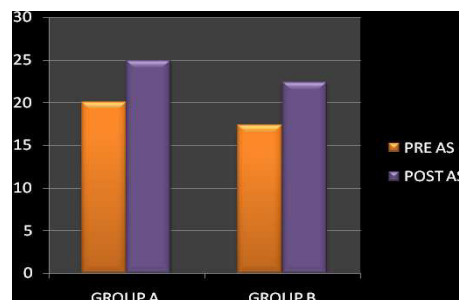


TABLE 8
COMPARISON OF MEAN DIFFERENCE OF ALGOMETRIC SCORE OF GROUP A AND GROUP B

	Mean	StdDev	P
Pre treatment	7.84	2.706	0.132
Post treatment	6.23	1.759	
Difference	1.61		

Mean difference of algometric score between group – A and group – B was not statistically significant (95% confidence interval for difference: $- 0.5344$ to 3.754).

GRAPH 8
COMPARISON OF MEAN DIFFERENCE OF ALGOMETRIC SCORE OF GROUP A AND GROUP B

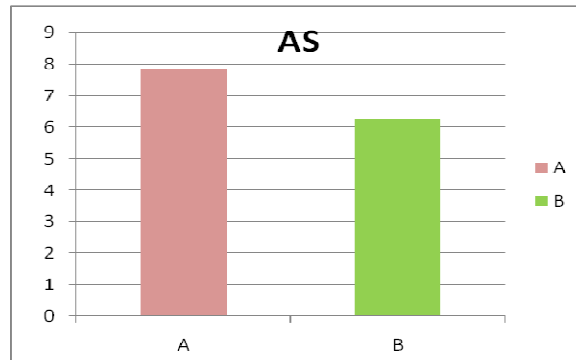


TABLE 9
COMPARISON OF PRE AND POST TREATMENT BDI SCORE OF GROUP A & GROUP B

	Group A			Group B		
	Mean	StdDev	p	Mean	StdDev	p
Pre treatment	10.4	2.066	0.000	12.3	2.83	0.000
Post treatment	6.9	1.197		6.1	0.7379	
Difference	3.5	1.179		6.2	2.658	

Table 9 Group A shows there is significant increase in the mean value of BDI scale post training with $p = 0.000$. This suggest that pilates exercise is effective in improving depression in FMS patients (95%confidence interval for difference: 2.657 to 4.343). Group B shows there is significant increase in the mean value of BDI score post training with $p = 0.000$. This suggest that yoga is effective in improving depression in FMS patients (95%confidence interval for difference: 4.298 to 8.102).

GRAPH 9
COMPARISON OF PRE AND POST TRAINING BDI SCORE OF GROUP A & GROUP B

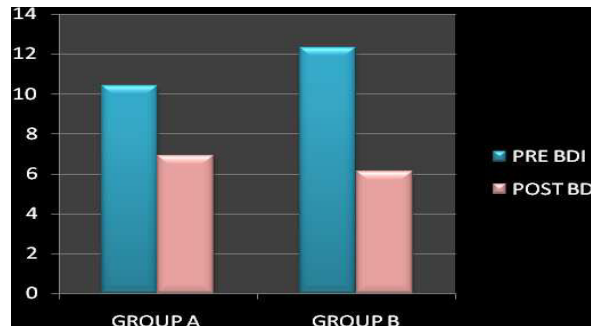


TABLE 10
COMPARISON OF MEAN DIFFERENCE OF BDI SCORE OF GROUP A AND GROUP B

	Mean	StdDev	P
Pre treatment	3.5	1.179	0.009
Post treatment	6.2	2.658	
Difference	-2.7		

Mean difference of BDI between group – A and group – B was not statistically significant.(95% confidence interval for difference: -4.632 to -0.7681)

GRAPH 10
COMPARISON OF MEAN DIFFERENCE OF BDI SCORE OF GROUP A AND GROUP B

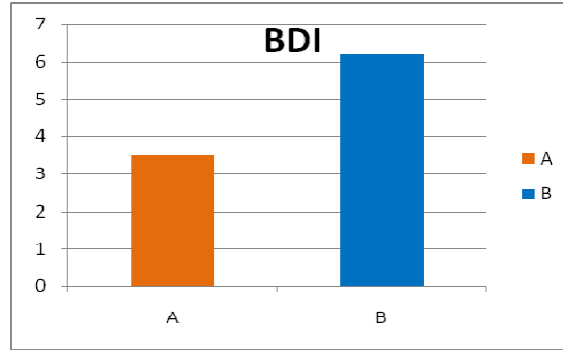


TABLE 11
COMPARISON OF PRE AND POST TREATMENT FSS SCORE OF GROUP A & GROUP B

	Group A			Group B		
	Mean	StdDev	p	Mean	StdDev	p
Pre treatment	4.718	0.6749	0.000	4.14	0.6327	0.000
Post treatment	3.272	0.6158		2.862	0.4904	
Difference	1.446	0.3545		1.278	0.4217	

Table 11 shows there is significant increase in the mean value of FSS scale post training with $p = 0.000$. This suggest that pilates exercise is effective in improving fatigue in FMS patients (95%confidence interval for difference: 1.192 to 1.7). Group B shows there is significant increase in the mean value of FSS score post training with $p=0.000$.This suggest that yoga is effective in improving fatigue in FMS patients (95%confidence interval for difference: 0.9764 to 1.58).

GRAPH 11
COMPARISON OF PRE AND POST TRAINING FSS SCORE OF GROUP A & GROUP B

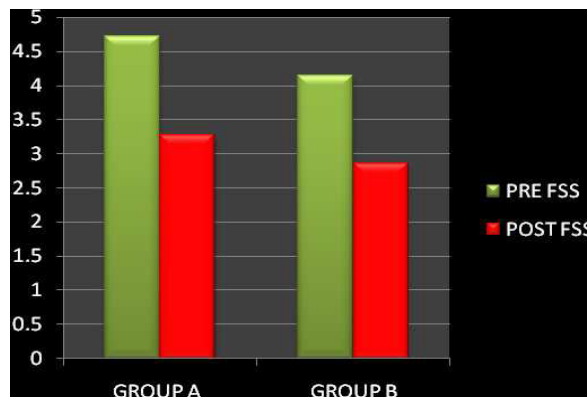
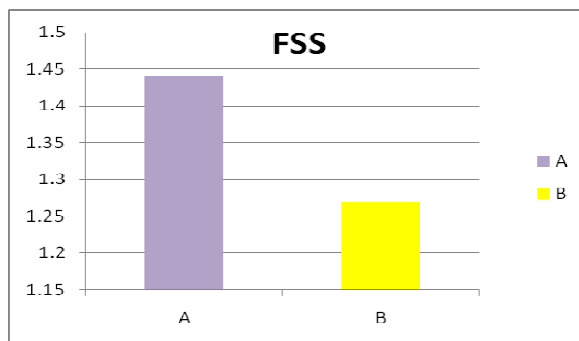


TABLE 12
COMPARISON OF MEAN DIFFERENCE OF FSS SCORE OF GROUP A AND GROUP B

	Mean	StdDev	p
Pre treatment	1.446	0.3545	0.348
Post treatment	1.278	0.4217	
Difference	0.168		

Mean difference of FSS between group – A and group – B was not statistically significant.(95% confidence interval for difference: -0.198 to 0.534).

GRAPH 12
COMPARISON OF MEAN DIFFERENCE OF FSS SCORE OF GROUP A AND GROUP B



Outcome Measures	P	Mean Diff	SD Diff.
VAS			
Group A	0.001	2.9	2.025
Group B	0.000	2.6	1.075
Group A & B	0.675	0.3	1.0623
TPI			
Group A	0.000	16.2	5.16
Group B	0.000	13.4	2.066
Group A & B	0.281	2.4	0.665
AS			
Group A	0.058	7.84	2.706
Group B	0.000	6.23	1.759
Group A & B	0.353	1.61	0.947
BDI			
Group A	0.000	3.51	1.179
Group B	0.000	6.2	2.658
Group A & B	0.089	0.8	0.4591
FSS			
Group A	0.000	1.446	0.3545
Group B	0.000	1.278	0.4217
Group A & B	0.117	0.41	0.1254

DISCUSSION

The 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 nonopioid mechanisms mediated by other substances such as growth hormone and corticotrophin.^{20,21} Analgesic effect of exercise may also help 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 seen in FMS patients.²² 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

CONCLUSION

Pilates exercises and Yoga both proved equally effective in treating Fibromyalgia statistically but, clinically Pilates exercises showed better improvement than Yoga.

REFERENCES

1. American Family Physician, Am Fam Physician, 2007, Jul 15; 76(2):247-254.
2. Schweinhardt P. Fibromyalgia: a disorder of the brain? *Neuroscientist*. 2008;14:415-421.
3. Myofascial pain and Fibromyalgia Syndromes, A clinical guide to diagnosis and Management, Peter E Baldry, Foreward by Brian Hazleman, Chap.16 Clinical characteristics and biopathophysiological mechanisms of fibromyalgia syndrome, Muhammad B. Yunus, Fatmalnanici, 351-371.
4. Shri K. Mishra, Parampreet Singh, Steven J. Bunch, and Ray Zhang, The therapeutic value of yoga in neurological disorders, *Ann Indian Acad Neurol*. Oct-Dec 2012; 15(4): 247–254.
5. Shridharan K, Patil SK, Kumaria ML, Selvamurthy W, Joseph NT, Nayar HS, et al. Study of some physiological and biochemical parameters in subjects undergoing yogic training. *Indian J Med Res*. 1981;74:120–4. [PubMed]
6. Field T(2011) yoga clinical research review. *Complement TherClin, Pract*17:1-8
7. Innes KE, Bourguignon C, Taylor AG (2005) Risk indices associated with the insulin resistance syndrome, cardiovascular disease, and possible protection with yoga: A systematic review. *J Am Board Fam Pract*18: 491-519.
8. Vera FM, Manzaneque JM, Maldonado EF, Carranque GA, Rodriguez FM, et al. (2009) Subjective sleep quality and hormonal modulation in long-term yoga practitioners. *BiolPsychol*81: 164-168.
9. Brotto LA, Mehak L, Kit C (2009) Yoga and sexual functioning: A review. *J Sex Marital Ther*35: 378-390.
10. Abeles M, Solitar BM, Pillinger MH, Abeles AM. Update on fibromyalgia therapy. *Am J Med*. 2008;121:555-561.
11. Harris RE, Clauw DJ, Scott DJ, McLean SA, Gracely RH, Zubieta JK. Decreased central u-opioid receptor availability in fibromyalgia. *J Neurosci*. 2007;27:10000-10006.
12. Sengupta P (2012) Health impacts of yoga and pranayama: A state-of-the-art review. *Int J Prev Med*3: 444-458.
13. Kinser PA, Goehler LE, Taylor AG (2012) How might yoga help depression? A neurobiological perspective. *Explore (NY)*8: 118-126.
14. Dr.Madanmohan MD, Effect Of Yogic Practices On Different Systems Of Human Body, Department of Physiology & Programme Director, ACYTER, JIPMER, Pg No 1-14.
15. Muscle Pain, Understanding its nature, Diagnosis and Treatment, Siegfried Mense, David G. Simons, I.Jon Russell, Chap 9, Fibromyalgia Syndrome, Pg.No. 289-337
16. Polly E. Bijur, Phd, Wendy Silver, Ma, E. John Gallagher, MD, Reliability of the Visual Analog Scale for measurement of Acute Pain, *Academic Emergency Medicine*, December 2001;8(12): 1-5.
17. Philipp O. Valko, MD; Claudio L. Bassetti, MD; Konrad E. Bloch, MD; Ulrike Held, PhD; Christian R. Baumann, MD, Department of Neurology, Pulmonary Division, and Horton Centre for Patient-Oriented Research, University Hospital of Zurich, Zurich, Switzerland, Validation of the Fatigue Severity Scale in a Swiss Cohort, *SLEEP*, , June 2008; 31(11).
18. Donald D. Price, Patricia A. McGrath, Amir Rafii and Barbara Buckingham, The Validation of Visual Analogue Scales as Ratio Scale Measures for Chronic and Experimental Pain, *Pain*, 1983;17:45-56.
19. Dozois, David J. A.; Dobson, Keith S.; Ahnberg, Jamie L , A psychometric evaluation of the Beck Depression Inventory–II, *Psychological Assessment*, June 1998;10(2):83-89.
20. Ramsay C, Moreland J, Ho M, Joyce S, Walker S, Pullar T. An observer-blinded comparison of supervised and unsupervised aerobic exercise regimens in fibromyalgia. *Rheumatology* 2000;39:501-5.
21. Kjaer M. Regulation of hormonal and metabolic responses during exercise in humans. *Exerc Sport Sci Rev* 1992;20:161-84.

22. Koltyn KF. Analgesia following exercise. A review. Sports Med 2000;29:85-98.
23. LaleAtlan, MD, NimetKoekmez, PhD, Effects of pilates training on prople with fibromyalgia syndrome, Arch Phys Med Rehabil 2009;90:1983-8.