

# A Comparative Study Effectiveness of Conventional Physiotherapy versus Yoga Therapy on Pain, Core Muscle Endurance, Lumbar Flexion Range of Motion and Functional Disability in Patients with Chronic Mechanical Low Back Pain

Sana Lalkate<sup>1</sup>, Ronika Agrawal<sup>2</sup>, Gayatri Karandikar Agashe<sup>3</sup>

<sup>1</sup>Masters of Physiotherapy Student, <sup>2</sup>Professor and Principal, <sup>3</sup>Associate Professor, M.A Rangoonwala college of Physiotherapy and Research, Pune, <sup>4</sup>Institution: M A Rangoonwala College of Physiotherapy and Research, Azam Campus, Off Shankar Sheth Road, Camp, Pune

## Abstract

**Introduction:** Low back pain (LBP) is one of the most common and significant clinical, social, economic, and public health problem affecting people all over the world. Physical therapists deal with considerable number of patients with LBP on a daily basis. Yoga has also been a promising treatment option over years for LBP patients. Thus, this study will help to compare the effectiveness of conventional physiotherapy treatment versus yoga therapy with respect to pain, lumbar range of flexion, endurance of Transversus abdominis (TA) and functional disability in patients with chronic mechanical LBP.

**Methodology:** Fifty four participants were included in an experimental study after screening for inclusion and exclusion criteria. Pretreatment measures for pain by numerical pain rating scale, lumbar range of flexion by Modified Schober's test, Transversus Abdominis endurance by prone test with pressure biofeedback and disability level by Modified Oswestry Disability Index (MODI) were taken.

**Conclusion:** The findings of this study suggest that yoga therapy is more effective in reducing pain, disability and improving lumbar flexion range whereas physiotherapy is more effective in increasing core muscle endurance in patients with chronic mechanical LBP.

**Key Words:** Yoga, physiotherapy, strengthening, LBP, core muscle endurance

## Background

LBP affects every 1 in 5 adults during their lifetime with its prevalence around 40%.<sup>1</sup> It also interferes with an individual's ability to work and overall quality of life (QOL).<sup>2</sup> LBP is usually defined as pain, muscle tension or stiffness localized below the costal margin and above the inferior gluteal folds, with or without leg pain.<sup>3,4</sup> LBP is typically classified as being 'specific' or 'nonspecific'.

Specific LBP is caused by a specific pathophysiologic mechanism. Non-specific LBP or mechanical LBP which is defined as symptoms without a clear specific cause, that is, LBP of unknown origin may be because of inappropriate posture, weak muscles, lower cross syndrome etc.<sup>4</sup> Chronic LBP is defined as the pain that persists longer than seven weeks.<sup>5</sup> 37% of Chronic LBP is attributable to occupational ergonomic stressors, both physical and psychosocial.<sup>6</sup> Most common reasons for back pain are incorrect postures, inadequate trunk muscle strength and psychological and emotional strain. LBP can cause muscle atrophy and inhibit muscle firing. This leads to altered spinal mechanics which may exacerbate the pain-spasm-pain cycle leading to increased dysfunction and decreased muscle endurance. LBP is strongly related to the strength of lumbar core

---

### Corresponding Author:

**Dr Sana Lalkate(PT)**

3100/2, Station Ali, Neral, 410101, India

Contact No.9820184048

Email id: lalkate.sana@gmail.com

musculature.<sup>6</sup>

Although there is a range of conventional pharmacologic, non-pharmacologic and surgical procedures used for non-specific chronic LBP, most patients report only moderate relief, at best. Commonly, management for non-specific chronic LBP includes advice to remain physically active, education on back self-care, medication, and physical therapy.<sup>7</sup> There are various interventions that can reduce pain and disability in patients with chronic mechanical LBP.<sup>8</sup>

In physical therapy, it is seen that the most effective exercise therapy strategy for improving chronic mechanical LBP is supervised, individually-tailored, high-dose stretching and muscle strengthening exercise programs with homepractice.<sup>7</sup> Over the last decade, yoga has been immensely promoted for the treatment of LBP. It can be performed by anyone at any age and level of fitness.<sup>2</sup> Yoga is also cost-effective in improving health related quality of life for patients suffering from pain. It has been suggested that yoga creates inner, physical and emotional balance through the use of postures, called asanas, which are combined with breathing techniques or pranayama that are based mainly on isometric muscle contractions.<sup>2</sup>

## Methods

In an Experimental study, 54 patients (Both males and females) between 25 - 45 years of age with mechanical low back pain for more than 7 weeks were selected.<sup>5</sup> Patients who have already participated in yoga or physical therapy in previous 6 months for conditions like LBP, pregnancy, chronic infections such as tuberculosis, compromised cardiovascular problems if recognized on history, spinal pathologies like spinal canal stenosis, spondylolisthesis, grade 3 prolapsed intervertebral disc, previous history of vertebral fracture or surgery, active malignancy, severe neurological deficits and those not willing to participate were excluded from the study.

Informed written consent was taken for participation in this study. Then patients were randomly assigned to Yoga group, Physiotherapy group and a Control group using chit method. The patients were then assessed for pain using Numerical Pain Rating Scale (NPRS), lumbar flexion ROM using Modified Schobers test, transversus abdominis muscle endurance using Prone test with

pressure biofeedback and functional disability using Modified Oswestry Disability Index (MODI).<sup>5</sup> Outcome measures were taken pretreatment and post 6 weeks of treatment in respective groups.

Total exercise program was for 6 weeks. Duration of treatment session was 30 min for the yoga group and the physiotherapy group. Control group was not given any intervention. A supervised session was taken for the first 2 days of every two weekly program for yoga and Physiotherapy group, after which the participant was told to continue the treatment protocol at home. A new program was prescribed at the end of 2<sup>nd</sup> and 4<sup>th</sup> week.

### YOGA Group

For, 0-2 weeks period, the hold time for each yoga posture was 30 seconds with 2 repetitions of each yoga posture, 60 seconds in 2-4 weeks period and 90 seconds in 4-6 weeks period with only one repetition of each yoga posture. A rest period of 30 seconds was given after each posture. Yoga postures included Padmasana, Ardh Matsyendrasana (right and left), Yog Mudra, Paschimotanasana, Bhujangasana, Naukasana, ArdhaChakrasana and Trikonasana (right and left). Breathing exercises and Shavasana was given at the start and the end of each session respectively.

### PHYSIOTHERAPY Group

This group consisted of lumbar stabilization with progressive limb loading with emphasis on abdominals and trunk extensors.<sup>9</sup> All exercises were done for 10 repetitions with a hold time of 10 seconds. A rest period of 1 min was given between every consecutive exercise. All exercises to be performed with core activation.

For 0 – 2 weeks it included Level 1, multifidus activation, Level 2, Level 3A, quadruped – flex one upper extremity, quadruped – extend one lower extremity by sliding it along the mat, supine twist, press up on elbows and bridging.<sup>9</sup>

For 2 – 4 weeks, it included Level 1, Level 3B, Level 3C, quadruped – extending one lower extremity by lifting it off the mat, quadruped – flexing one upper extremity while extending contralateral lower extremity and then alternate to opposite extremities, press up on hands, unilateral cycling, bilateral cycling.<sup>9</sup>

For 4 – 6 weeks, it included Level 1, Level 4A, Level 4B, prone lying - extend one lower extremity, curl ups - hands by the side, curl ups – hands behind the neck, diagonal curl ups, superman’s exercise, double knee to chest.<sup>9</sup>

Schobers test, Prone test with pressure biofeedback and Modified oswestry disability index. There was significant improvement in both physiotherapy and yoga group in all the four outcome measures whereas there was deterioration in the control group in all the outcome measures.

## Results and Discussion

Pre and post treatment measures were taken after 6 weeks on Numerical pain rating scale, Modified

**Table 1: Comparison of mean difference (pre and post 6 weeks) of NPRS scores in all 3 groups using Anova test**

	MEAN	P value	
Yoga	-4.1333	1.2 x 10 <sup>-7</sup>	Significant
Physiotherapy	-2.8		
Control	0.235294		

### Inference:

Yoga group has more improvement in pain compared to Physiotherapy group. Control group shows increase in pain ( $P < 0.05$ )

**Table 2: Comparison of mean difference (pre and post 6 weeks) of Modified Schober’s test scores in all 3 groups using Anova test**

	MEAN	P value	
Yoga	0.933333	4.95 x 10 <sup>-6</sup>	Significant
Physiotherapy	0.55625		
Control	-0.07778		

### Inference:

Yoga group has maximum improvement in lumbar flexion ROM compared to Physiotherapy group and Control group shows decrease in lumbar flexion ROM ( $P < 0.05$ )

**Table 3: Comparison of mean difference (pre and post 6 weeks) in core muscle endurance using Prone test scores in all 3 groups using Anova test**

	MEAN	P value	
Yoga	-1.33333	4.95 x 10 <sup>-7</sup>	Significant
Physiotherapy	-4.25		
Control	-0.22222		

### Inference

It shows Physiotherapy group has maximum improvement in the lumbar core endurance compared to Yoga group and control group has least improvement ( $P < 0.05$ ).

**Table 4: Comparison of mean difference (pre and post 6 weeks) of Modified Oswestry Disability Index (MODI) in all 3 groups using Anova test**

	MEAN	P value	
Yoga	-21.7333	2.69 x 10 <sup>-7</sup>	Significant
Physiotherapy	-17		
Control	2.666667		

Inference:

It shows yoga group has maximum improvement in the disability level due to low back pain compared to physiotherapy group and control group shows increase in disability level ( $P < 0.05$ )

### Discussion

The aim of this study was to compare the effectiveness of conventional physiotherapy treatment versus yoga therapy for chronic mechanical LBP. The results of the study showed that there was reduction in pain, increase in lumbar flexion range of motion, increase in lumbar core muscles endurance and reduction in disability due to LBP in both physiotherapy and yoga group. However, control group shows deterioration in pain, lumbar flexion range of motion and disability due to LBP.

There is a significant reduction in the pain in yoga group ( $p < 0.05$ ) and physiotherapy group ( $p < 0.05$ ) post treatment whereas control group shows increase in pain. Both yogasanas and physiotherapy exercises stimulate stretch proprioceptors which send neural impulses to the higher centers. These neural impulses interfere and block impulses on the ascending pain pathway, by pain gate mechanism. They also stimulate the periaqueductal grey matter and raphe nucleus which are a part of descending pain suppression pathway. This leads to inhibition of pain information at the spinal cord.<sup>1</sup> When 3 groups were compared for pain (Table 1) yoga group shows maximum improvement in pain scores. Yoga's maximum efficacy in pain reduction may be due to endorphin production at a cortical level, which is known to result from alternate stretch-and relax procedures of yoga asana practice.<sup>1</sup>This could also be because yoga involves muscle relaxation and it also has an emotional component to it. Yoga is found to reduce anxiety and lower depression levels.<sup>1</sup>It is stated as yoga

is a combination of careful body movement together with active mindfulness and concentration. Thus this helps promote deeper relaxation and thus maximum pain relief.<sup>1</sup> Both yoga and physiotherapy also increase core muscle strength thus providing maximum support to the spine maintaining a better posture thus reducing LBP. Also other studies prove that yoga intervention is associated with longer lasting reductions in pain outcomes because yoga is a combination of postures, breathing exercises, relaxation, and meditation, thus enhancing parasympathetic tone and thus better effects.<sup>2,10</sup>

There is a considerable increase in the flexibility of the lumbar spine in both Yoga and Physiotherapy group ( $p < 0.05$ ). But control group shows reduction in range of the lumbar spine flexion. This could be because yoga involves holding a position for a particular duration leading to gradual lengthening. During the practice of yoga, the breath is regulated and mental focus is directed to it, resulting in physical and psychological benefits. Yoga increases flexibility and strength, tones the muscles and reduces muscular tension.<sup>11</sup>Yoga practice also increases proprioceptive ability and hence may help in adopting the correct posture to relax muscular tension. It is possible that the perceived decrease in pain and increase in flexibility may have been due to reduced tension in para-vertebral muscles.<sup>11</sup> Table 2 suggest comparatively a lower improvement in physiotherapy group with respect to flexibility because it concentrated more on lumbar core muscles and attaining and holding a particular position and it did not comprise more of

stretching exercises. On the contrary all yoga asanas includes stretching components and with maintenance of that posture, whereas physiotherapy focuses on attaining a posture and coming back to starting position. Studies also prove that yoga therapy increased hip flexion, spinal and hamstring flexibility<sup>11</sup> like any other stretching exercise, but the effects with yoga had long lasting effects for several months.<sup>12</sup> The fact that control group shows decrease in lumbar flexion range of motion is because due to pain subjects avoid end range of motion and further increase in soft tissue tightness.

It is known that core muscle activation is impaired in patients with chronic LBP and is thought to contribute to spinal instability<sup>6</sup>, which may cause the patients symptoms to persist. There is a slight improvement in core muscle endurance in yoga group ( $p < 0.05$ ) whereas a much more improvement is found in Physiotherapy Group ( $p < 0.05$ ). Table 3 compares yoga and physiotherapy group for core muscle endurance. Physiotherapy group was better than yoga group as it consisted mainly of exercises emphasizing on transverses abdominis and multifidus muscle activation which are main core stabilizers. It is well documented in the literature that total muscle activation is necessary to efficiently stabilize the spine and the no single muscle contributes greatest to lumbar stability.<sup>6</sup> The exercises for physiotherapy group recruited all muscles like obliques, upper abdominals, rectus abdominis along with core muscles. Drawing-in maneuver was chosen as an exercise in physiotherapy group for complete 6 weeks. It is a highly effective and specific technique that activates all of the core musculature with a low to moderate cost to lumbar spinal compression. Another study also states that exercises specific to transverses abdominis gives better benefit in patients of chronic LBP compared with general exercise.<sup>13</sup> Yoga group also showed mild improvement in core muscle as yogasanas are postures targeting the lower back, but no specific emphasis is given on core muscles, however, core muscles are continuously activated in all yogasanas. Taking into consideration the control group, it didn't show any significant change in core muscle endurance because they were not actively involved in any exercise intervention.

A significant improvement is seen in level of disability due to LBP in both yoga and physiotherapy

group ( $p < 0.05$ ). Disability level is dependent on pain, flexibility and core strength. As there is significant improvement in all the above parameters in both these groups, there is significant reduction in disability level as well. Control group shows significant increase in disability level in the period of 6 weeks ( $p < 0.05$ ). Table 4 shows that there is more improvement in yoga group as yoga therapy caused a significant reduction in pain intensity and increase in flexibility. Also it was found in other studies that yoga intervention is associated with long lasting improvement in quality of life compared to physiotherapy exercise intervention.<sup>2</sup> This is because yoga therapy causes a marked improvement in balance, flexibility and depression leading to a greater reduction in disability level compared to physiotherapy group.<sup>14</sup>

### Conclusion

The study concluded that Yoga therapy and physiotherapy, both are effective for patients with chronic mechanical low back pain however, yoga therapy is more effective in reducing pain and disability and improving lumbar range of flexion whereas physiotherapy is more effective in increasing core muscle endurance in chronic mechanical low back pain.

**Conflict of Interest:** None

**Ethical Clearance:** Ethical clearance was obtained from the institutional ethical committee

**Consent:** A informed written consent was taken from all the participants under study.

### References

1. Tekur P, Nagarathna R, Chametcha S, Hankey A, Nagendra HR. A comprehensive yoga programs improves pain, anxiety and depression in chronic low back pain patients more than exercise: an RCT. *Complementary therapies in medicine*. 2012 Jun 30;20(3):107-18.
2. Nambi GS, Inbasekaran D, Khuman R, Devi S, Jagannathan K. Changes in pain intensity and health related quality of life with Iyengar yoga in nonspecific chronic low back pain: A randomized controlled study. *International journal of yoga*. 2014 Jan 1;7(1):48.
3. Posadzki P, Ernst E. Yoga for low back pain: a

- systematic review of randomized clinical trials. *Clinical Rheumatology*. 2011 Sep 1;30(9):1257.
4. VanMiddelkoop M, Rubinstein SM, Verhagen AP, Ostelo RW, Koes BW, van Tulder MW. Exercise therapy for chronic nonspecific low-back pain. *Best practice & research Clinical rheumatology*. 2010 Apr 30;24(2):193-204.
  5. David J. Magee, *Orthopaedic Physical Assessment*, 5<sup>th</sup> Ed, Canada: Elsevier; 2008
  6. Johnson J. *Functional Rehabilitation of Low Back Pain With Core Stabilizations Exercises: Suggestions for Exercises and Progressions in Athletes*; 2012
  7. Saper RB, Sherman KJ, Delitto A, Herman PM, Stevans J, Paris R, Keosaian JE, Cerrada CJ, Lemaster CM, Faulkner C, Breuer M. Yoga vs. physical therapy vs. education for chronic low back pain in predominantly minority populations: study protocol for a randomized controlled trial. *Trials*. 2014 Dec;15(1):67.
  8. Munk R. Yoga classes may be an alternative to physiotherapy for people with chronic nonspecific low back pain [commentary]. *Journal of physiotherapy*. 2018 Jan 1;64(1):57.
  9. Carolyn Kiesner, Colby. L, *Therapeutic Exercise Foundations and Techniques*, 6<sup>th</sup> Edition, F. A. Davis Company; 2012
  10. Sherman KJ. Guidelines for developing yoga interventions for randomized trials. *Evidence-Based Complementary and Alternative Medicine*. 2012;2012.
  11. Telles S, Bhardwaj AK, Gupta RK, Sharma SK, Monro R, Balkrishna A. A Randomized Controlled Trial to Assess Pain and Magnetic Resonance Imaging-Based (MRI-Based) Structural Spine Changes in Low Back Pain Patients after Yoga Practice. *Medical Science Monitor: International Medical Journal of Experimental and Clinical Research*. 2016;22:3238
  12. Sherman KJ, Cherkin DC, Wellman RD, Cook AJ, Hawkes RJ, Delaney K, Deyo RA. A randomized trial comparing yoga, stretching, and a self-care book for chronic low back pain. *Archives of internal medicine*. 2011 Dec 12;171(22):2019-26.
  13. Lizier DT, Perez MV, Sakata RK, "Exercises for Treatment of Nonspecific Low Back Pain". 2012 Nov-Dec;62(6):838-46
  14. Gatantino ML, Bzdewka TM, Eissler-Rnsso JL, Holbrook ML, Mogck EP, Geigle P, Farrar JT. The impact of modified Hatha yoga on chronic low back pain: a pilot study. *Alternative Therapies in Health & Medicine*. 2004 Mar 1;10(2).