

# **EFFECT OF LUMBAR STABILIZATION EXERCISE AND LUMBAR EXTENSION EXERCISE IN THE TREATMENT OF CHRONIC LOW BACK PAIN**

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## **Abstract**

The objective of this study is to determine the effect of lumbar stabilization exercise and lumbar extension exercise in chronic low back pain patients. The study design is Randomized clinical trial. 40 patients with chronic low back pain were selected from Gee Bee Physio Clinic, Chidambaram, Cuddalore District, Tamilnadu. They were randomly divided into 2 groups. Of them, 20 patients were given lumbar stabilization exercise and the remaining 20 were given lumbar extension exercise. They both were given interferential therapy and the results were analyzed. The outcome measures used were Numerical pain rating scale for pain and the Oswestry disability questionnaire for disability. The analysis was done using two way ANOVA. The analysis of the results shows that lumbar stabilization exercise showed much improvement in both pain and disability when compared to extension exercise group.

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**Keywords:** Chronic low back pain, lumbar stabilization exercise, lumbar extension exercise, exercise therapy

## **Introduction**

Low back pain is a severe psychological as well as physical dysfunction (Ackerman, MD, 1989). The analysis of low back pain involves the knowledge of anatomy, physiology along with the thorough understanding of the multifactorial nature of pain (Delisa, Joel A, 2005). Low back pain has been reported as the most frequent cause of disability for individuals less than 45 years old and the third leading cause of disability for those more than 45 years old (Andersson GBJ,1997,1998). It is said that 70% to 80% of the people of United States bear on back pain at any one point of their lifetime (Anderson GBJ, 1999). Low back pain is neither a disease, nor a diagnostic entity of any sort (George E. Ehrlich1, 2003). Most of the time

low back pain is not of specific cause. Some times the low back pain symptoms resolve with some rest and some analgesics and sometimes some electrotherapy modalities (Jorge P, 2010, Matthew S Thiese, 2013). But most of the time it lasts for more than three months, which has some phases of recurrence. Physiotherapy plays a major role in the management of low back pain. As many as one fourth of the total number of patients referred to physiotherapy are of low back pain. Thus low back pain has become a cause of great economic as well as clinical significance and concern (Jayant Joshi, 1999). Exercise therapy plays a vital role in the reduction of low back pain and in the reduction of phases of recurrence (Choi BK, 2010). There are number of exercises that play a major role in the reduction of low back pain. Since 1990, lot many randomized control trial studies were published which demonstrates the effect of exercise in chronic low back pain. Recently new studies have been emerging which demonstrates the effect of lumbar stabilization exercise. So it will be worth to compare the effect of stabilization exercise with that of lumbar extension exercise.

## **Materials and methods**

### **Study design**

Randomized control design

### **Study setting**

Gee Bee Physio clinic, Chidambaram, Cuddalore district, Tamilnadu, India.

### **Method**

40 patients from the GB Physio clinic, Chidambaram, Tamil Nadu, India were selected for this study purpose. Clinically diagnosed cases of chronic low back pain within the age 22-70 years irrespective of sex were included. The patients with low back pain with and without radiating pain were taken into study. Among those (n=20) twenty patients were selected randomly in group A, who has been trained with lumbar stabilization exercise and the remaining twenty patients (n=20) were considered as group B, and they were trained with lumbar extension exercise. Among 40 patients 37.5% were male and 62.5% were females. 57.5% were employed and 42.5 were not employed. 30% were smokers. Coming to their pain, 32.5% were having radiating pain, and the remaining 67.5% were without radiating pain. 80% of the patients were married and 20% of the women were having post partum pain. The average height of the patients is 160.85cms and the average weight is 64.075kg. The average age group of the patients is 41.35. The characteristics were displayed in table 1.

Table 1: Group characteristics

No of Patients	40	Percentage
Male	15	37.5
Female	25	62.5
Employed	23	57.5
Housewives	17	42.5
Smokers	12	30
With radiating pain	13	32.5
Without radiating pain	27	67.5
Post partum pain	8	20
Marital status	34	85

Both the group of patients were given interferential therapy for 5 days per week for three weeks (Gundog, 2012). For group A, lumbar stabilization exercise has been given for 8 weeks duration, and the exercise was given twice a week in the presence of the physiotherapist. For group B, the lumbar extension exercise was given for 8 weeks duration and the exercise was given twice a week in the presence of the physiotherapist (Petersen, 2002). Before the treatment session the pain and disability of the patients in each group were assessed with the help of numerical pain rating scale and the Oswestry Low Back Pain Disability Questionnaire respectively. After 8 weeks they were again assessed, and the improvement levels were calculated. Before the exercise session ten minutes warm up were given to each patient in both the groups.

Group A patients were given stabilization exercises like pelvic bridging, single leg bridging and ball exercises were given. The holding time for each exercise is ten seconds and they were asked to do each exercise for ten repetitions (O'Sullivan, 1997). For group B, lumbar extension exercises in prone lying, leg lifting, whole body lifting, both head and legs lifting were given. Each exercise is done ten repetitions, and the holding time for each contraction is ten seconds.

### **Outcome measurements**

The effects of treatment were perceived pain and disability. The main outcome measures were numerical pain rating scale for pain and Oswestry Low Back Pain Questionnaire for disability assessment.

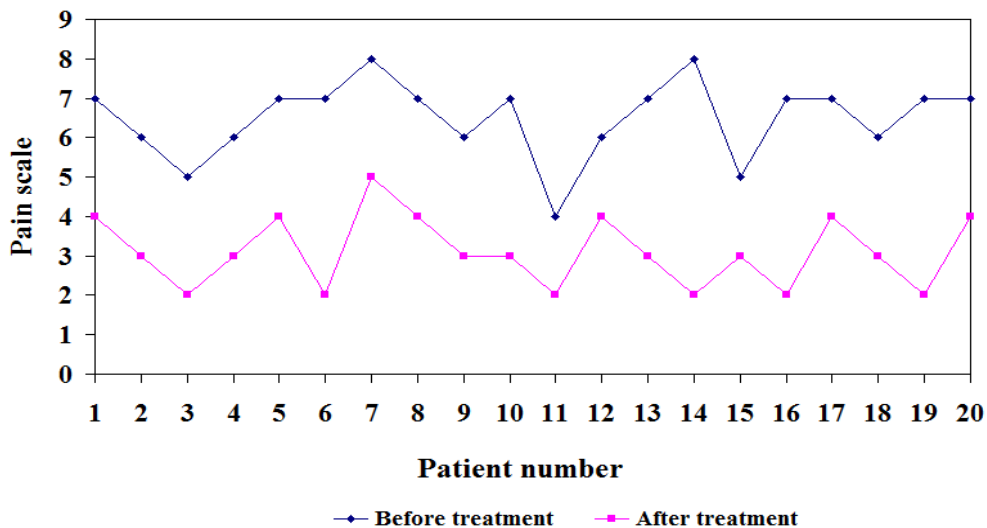
### **Numerical pain rating scale**

This is a 11 point scale and the patient is asked to choose a number from 0 to 10 that best describes their current pain. 0 means 'no pain' and 10 means 'worst possible pain'

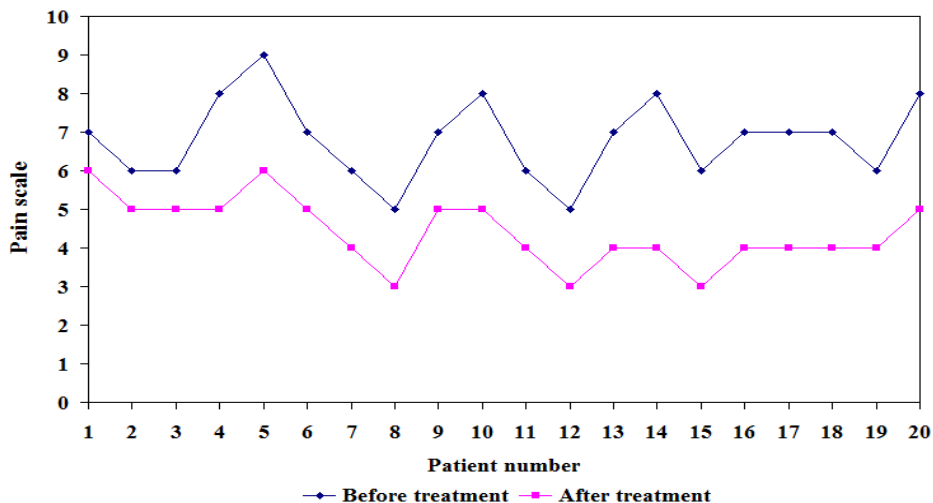
### Oswestry low back pain questionnaire

This is a questionnaire used to calculate the improvement of the disability of the patient before and after the treatment. Among many scales this has been considered as the best protocol to find the disability of the patient (Davidson M, 2002).

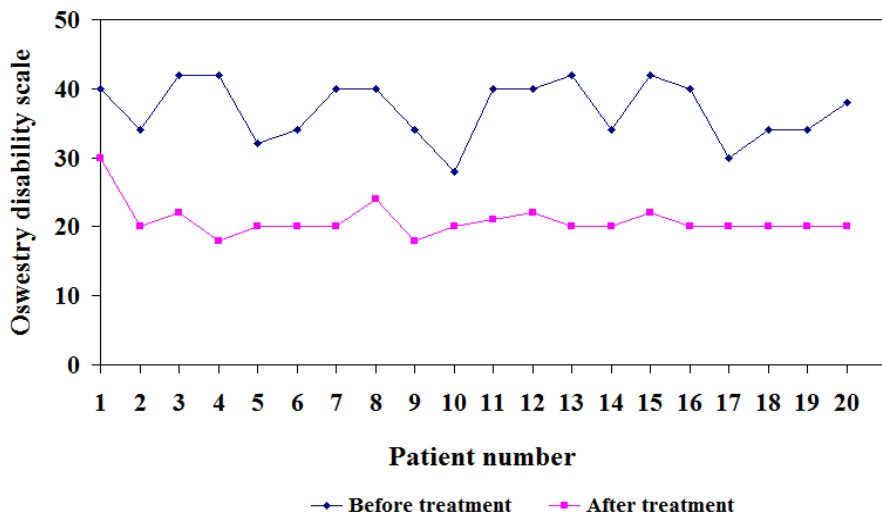
Numerical pain rating scale in lumbar stabilization exercise group (Figure.1)



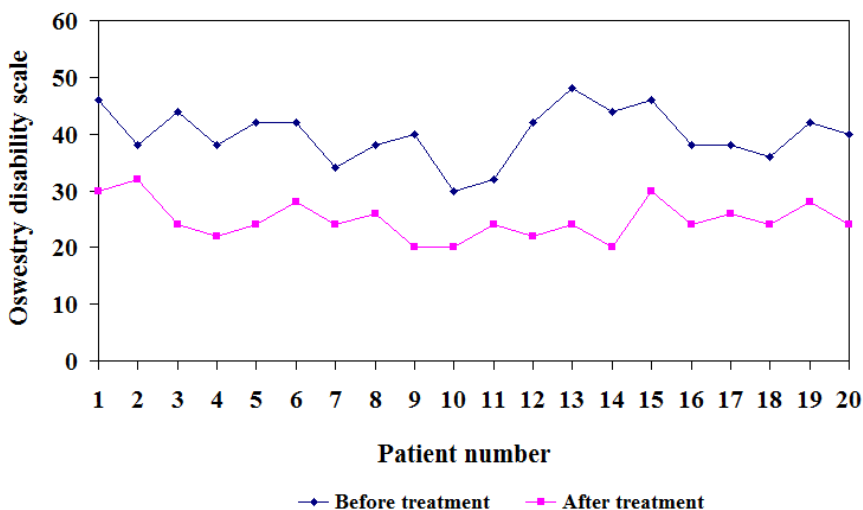
Numerical pain rating scale in lumbar extension exercise group (Figure.2)



Oswestry disability scale in lumbar stabilization group (Figure.3)



Oswestry disability scale in lumbar extension exercise group (Figure.4)



**Results**

The outcome measures were numerical pain rating scale for pain and Oswestry disability scale for disability. Figure.1 shows the variation of pain before and after treatment in the lumbar stabilization group. Figure.2 shows the variation of pain before and after treatment in the lumbar extension group. Though both the groups show the reduction of pain, the stabilization group showed much more reduction of pain than the extension exercise group. Figure.3 shows the variation of disability before and after treatment in lumbar stabilization group. Figure.4 shows the variation of disability before

and after treatment in lumbar extension exercise group. Though both the groups showed significant reduction of disability, the lumbar stabilization group showed much more improvement than lumbar extension exercise group.

The analysis is done by using two way ANOVA method. The calculations are explained in table 2. The sum of the squares within groups in the case of stabilization exercise group is 375.35 and in the case of extension exercise group is 472.6. The sum of the squares between groups in the stabilization group is 1625.625 and in the other one is 1612.9. The sum of the total squares is 2000.9 in the stabilization exercise group and 2085.50 in the extension exercise group. The F value of the stabilization exercise group and the extension exercise group are 164.57 and 129.68 respectively. The P value for both the groups are <0.001. This shows that both the exercises showed significant improvement in pain and disability. But by the analysis of the values, the stabilization exercise is more effective in treating chronic low back pain when compared to the lumbar extension exercise.

Table 2. Analysis by two way ANOVA

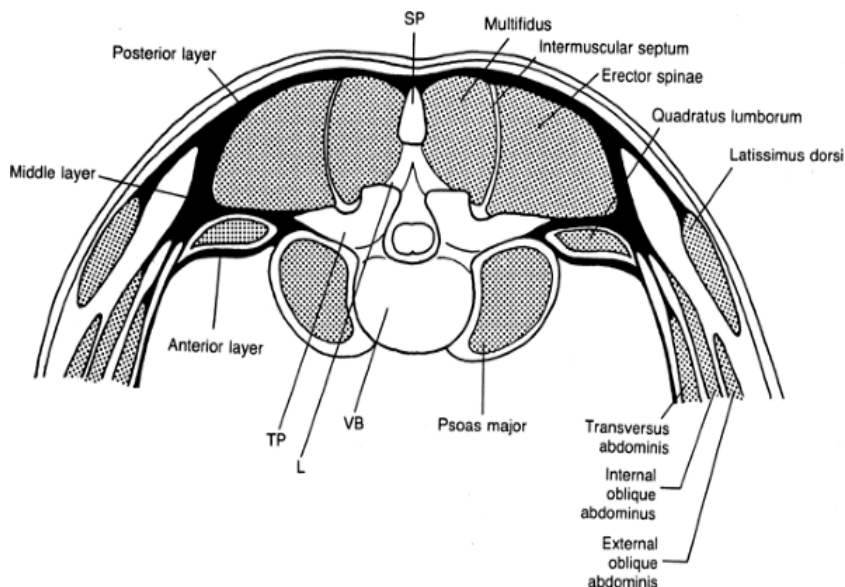
Group	Sum of squares within groups	Sum of squares between groups	Sum of total squares	F value	P value
Group A	375.35	1625.62	2000.9	164.57	<0.001
Group B	472.60	1612.9	2085.50	129.68	<0.001

## Discussion

Lumbar instability is considered to be one of the potential causes of low back pain (Panjabi MM, 1992). The muscles like multifidi which are short intersegmental, help in the maintenance of the intervertebral position during the movement of the trunk and they also help in increasing the lever arm of the longer muscles like erector spinae which are poly segmental. The erector spinae not only help in lumbar extension and also does the role in the eccentric control of lumbar flexion. It also provides extra support by their attachment to thoraco lumbar fascia . There are evidences that these muscles are preferentially affected in the presence of chronic low back pain (Biedermann HJ, 1991). Classic trunk exercises performed in physical therapy activate the abdominal and paraspinal muscles as a whole and at a relatively high contraction level (McGill SM., 1998 , Arokoski JPA , 1999).

There are some of the evidences which support the role of stabilization exercise in lower back pain with respect to the recurrence of symptoms (Hides JA , 1996). Stabilization training may be useful in reducing pain and disability for all patients with non-specific low back pain (Norris C, 2000).

The Figure. 5 shows the stabilizers (Porterfield JA , 1991).



### Stabilizers-Figure 5

There is also a significant relationship between muscle weakness and chronic low back pain (Cassisi Je, 1993, Lee JH, 1999). The extension exercises increase the strength of the extensor muscles and also increases the mobility of the lumbar spine. This gives the support for the spine and thereby reducing the pain and disability. When the back muscles are strong, the possibility of the back pain is very less. Researchers found that people with chronic low back pain had small and weak muscles in the back. This shows the significance of the back muscle strength.

Though the scale shows the reduction of pain and disability in the extension exercise group, the stabilization exercise group shows much improvement. It is well-established that pelvic stabilization is necessary to achieve optimal recruitment of the lumbar extensor muscles during lumbar extensor exercise. This has been shown with both dynamic and isometric exercise modalities (San Juan JG, 2005, Shirado O, 1995). In addition, traditional trunk extension exercises that do not stabilize the pelvis have been shown to produce low levels of electromyographic (EMG) activity in the lumbar extensor muscles (Souza GM, 2001). The results of this study support the hypothesis that the stabilization of the lumbar spine muscles is more effective in reducing the pain and functional disability in patients with chronic low back pain when compared to lumbar extension exercise.

### Conclusion

The study concludes that both lumbar stabilization exercise and lumbar extension exercise showed significant improvement in pain and

disability in chronic low back pain patients. The findings reveal that lumbar stabilization exercise is more effective than lumbar extension exercise in chronic low back pain patients.

### References:

- Ackerman, MD, Stevens MJ: Acute and chronic pain: (1989), Pain dimensions and psychological status. *J Clin Psych* 76:223-228,
- Delisa, Joel A.; Gans, Bruce M.; Walsh, Nicolas E.; Bockenek, William L.; Frontera, Walter R.; Geiringer, Steve R.; Gerber, Lynn H.; Pease, Willian S.; Robinson, Lawrence R.Smith,Jay; Stitik, Todd P; Zafonte, Ross O, (2005),*Physical Medicine & Rehabilitation: Principles and Practice*, 4<sup>th</sup> Edition
- Andersson GBJ,(1998). Epidemiology of low back pain. *Acta Orthop Scand* ;69[Suppl 281]
- Andersson GBJ(1997). The Epidemiology of Spinal Disorders. In Frymoyer JW (ed.) *The Adult Spine: Principles and Practice*. Philadelphia, Lippincott-Raven, pp. 93–141
- Anderson GBJ(1999). Epidemiological features of chronic low back pain. *Lancet*, 354: 581-585.
- George E. Ehrlich1 (2003), Low Back Pain, *Bulletin of the World Health Organization* , 81 (9) .
- Jorge P. Fuentes, Susan Armijo Olivo, David J. Magee and Douglas P. Gross (2010), Effectiveness of Interferential Current Therapy in the Management of Musculoskeletal Pain: A Systematic Review and Meta-Analysis , *physical therapy*,vol 90 no.9 1219-1238.
- Matthew S Thiese, Matthew Hughes and Jeremy Biggs (2013),Electrical stimulation for chronic non-specific low back pain in a working-age population: a 12-week double blinded randomized controlled trial, *BMC Musculoskeletal Disorders* 14:117.
- Jayant Joshi Ex-superintendent, physiotherapy, All India Institute of Medical Sciences, New Delhi, Prakash Kotwal MS Ortho, Professor, Dept of Orthopaedics, AIMS New Delhi (1999), *Essentials of Orthopaedics and Applied Physiotherapy*, ISBN 81-7042-141-1.
- Choi BK, Verbeek JH, Tam WW, Jiang JY (2010), Exercises for prevention of recurrences of low-back pain.,*Pub Med* CD006555. doi: 10.1002/14651858.CD006555.pub2.
- Gundog, Meltem MD; Atamaz, Funda MD; Kanyilmaz, Selcen MD; Kirazli, Yesim MD; Celepoglu, Gunay MD, (2012), Interferential Current Therapy in Patients with Knee Osteoarthritis: Comparison of the Effectiveness of Different Amplitude-Modulated Frequencies, *American Journal of Physical Medicine & Rehabilitation*: doi: 10.1097/PHM.0b013e3182328687



- Petersen, Tom PT, BSc, Kryger, Peter MD, PhD, Ekdahl, C. PT, PhD, Olsen, Steen PT, MDT, Jacobsen, Soren MD, PhD (2002), The effect of McKenzie therapy as compared with that of intensive strengthening training for the treatment of patients with subacute or chronic low back pain: A randomized controlled trial, *Spine*, Vol27(16), pp 1702-1709.
- O'Sullivan, Peter B.; Phyt, Grad Dip Manip; Twomey, Lance T. PhD; Allison, Garry T. PhD, (1997), Evaluation of Specific Stabilizing Exercise in the Treatment of Chronic Low Back Pain With Radiologic Diagnosis of Spondylolysis or Spondylolisthesis, *Spine*, Vol22(24), pp 2959-2967.
- Davidson M, Keating JL, (2002), A comparison of five low back disability questionnaires: reliability and responsiveness. *Phys Ther.* ;82(1):8-24.
- Panjabi MM, (1992), The stabilising system of the spine. Part 1: Function, Dysfunction adaptation and enhancement. *J Spinal Disord*, 5:383-389.
- Biedermann HJ, Shanks GL, Forrest WJ, Inglis J. (1991), Power spectrum analysis of electromyographic activity. *Spine*;16:1179-84.
- McGill SM. (1998), Low back exercises: evidence for improving exercise regimens. *Phys Ther.* ;78:754–765
- Arokoski JPA, Kankaanpää M, Valta T, et al. (1999) Back and hip extensor muscle function during therapeutic exercises. *Arch Phys Med Rehabil* ;80:842–850.
- Hides JA, Richardson CA, Jull GA. (1996) Multifidus muscle recovery is not automatic after resolution of acute, first-episode low back pain. *Spine*;21:2763–2769.
- Norris C. (2000) *Back Stability*. Champaign, Ill: Human Kinetics Inc.
- Porterfield JA, DeRosa C. (1991) Mechanical low back pain. Perspectives in functional anatomy. Philadelphia: WB Saunders, :56.)
- Cassisi Je, Robinson ME, O'Conner P, et al (1993), Trunk strength and lumbar paraspinal muscle activity during isometric exercise in chronic low-back pain patient and controls. *Spine*, 18:245-251
- Lee JH, Hoshino Y, Nakamura K, et al (1999) Trunk muscle weakness as a risk factor for low back pain, 24: 54-57.
- San Juan JG, Yaggie JA, Levy SS, Mooney V, Udermann BE, Mayer JM (2005), Effects of pelvic stabilization on lumbar muscle activity during dynamic exercise. *Journal of Strength and Conditioning Research* ; 19(4):903-7.
- Shirado O., Ito Y, Kaneda K, Strax, T E (1995), Flexion-relaxation phenomenon in the back muscles - a comparative study between healthy subjects and patients with chronic low back pain. *American Journal of Physical Medicine and Rehabilitation* ; 74: 139-144.
- Souza GM, Baker LL, Power CM. (2001) Electromyographic activity of selected trunk muscles during dynamic spine stabilization exercise. *Archives of Physical Medicine and Rehabilitation*; 82: 1551-1557.