



## Research article

# A STUDY TO ASSESS THE EFFECTIVENESS OF CORE MUSCLE STABILIZATION REGIMEN IN PATIENTS WITH MECHANICAL LOW BACK ACHE

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### Abstract

*Low back ache has a lifetime prevalence of over 70% in industrialized countries, and 85-95% of the cases are diagnosed as “non-specific low back pain”. Low back pain is the second most common reason for absenteeism from work and one of the most common reasons for medical consultation. From an extensive study, it appears that significant low back pain begins at the age of about 35 years. An quasi-experimental study was conducted to evaluate and compare the effectiveness of core muscle stabilization regimen in patients with mechanical low back ache. Eighty patients with mechanical low back ache who had participated in the study were equally divided into two group, 40 patients in each, Experimental and control group as randomization was not carried out, hence it is Quasi-experimental study. Experimental group received core muscle stabilization regimen and back care, control group received extension maneuver. Pain and disability were measured before starting the intervention. In each group, patients were started with warm-up in static cycling for 10mins followed by exercise program and back care. For every week of intervention program, the pain and disability score was assessed. The data were analysed statistically by Friedmann ANOVA, Mann Whitney u-test, t-test. The results concluded that core muscle stabilization regimen is effective along with back care and ergonomic advice than the spinal extension maneuver alone to reduce pain and to improve functional ability of the lumbar spine in subjects with mechanical low back ache.*

**Key words:** Low back ache, core muscle stabilization, ergonomic advice

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## INTRODUCTION

Low back pain is one of the common cause of occupational disability<sup>1</sup>. It occurs with about the same frequency in people with sedentary occupations as in people doing heavy labour, although the latter have a higher incidence of absence from work because they are unable to work with their complaint<sup>2</sup>.

The significance of physical activity plays a vital role in management of low back ache. Auvinen found that patients with chronic low back pain are less physically active or fit than healthy individuals<sup>3</sup>. The major factor which is responsible for low back ache is abdominal muscle weakness, an imbalance between spinal flexors and extensors leads to instability<sup>4</sup>.

Antagonistic activation of abdominal muscles and increased intra-abdominal pressure are associated with both spinal unloading and spinal stabilization. Rehabilitation regimens have been proposed to improve spinal stability via selective recruitment of certain trunk muscle groups<sup>5</sup>. Core stability refers to the ability of the core muscles to stabilize the spine whereas core strength denotes the ability of the core musculature to then produce the needed contractile force and intra-abdominal pressure for movement<sup>6</sup>.

Physiotherapy management of low back ache which includes spinal exercises, physical agents, spinal traction, spinal supports<sup>7</sup> and many other

approaches used in clinical practice have some potential to assist the integration of local and global stability retraining once the basic motor control correction has been made. Alternative approaches to low back ache include Tai Chi<sup>8</sup>, Yoga<sup>9</sup>, The Feldenkrais Technique<sup>10</sup>, Pilates program<sup>11</sup>.

This study aims to determine the effectiveness of core muscle stabilization regimen with back care in patients with mechanical low back ache. Core muscle stabilization training uses exercises specifically designed to provide a “muscle corset”, limiting undesirable motions and allowing healing to occur<sup>12</sup>. Risk factor for low back pain is weakness of superficial trunk and abdominal muscles; strengthening of these muscles is often associated with significant improvements of chronic low back pain as well as with decreased functional disability<sup>13</sup>. Strong abdominal muscles provide support for the lumbar spine during every day movements. Strengthening the abdominal muscles may decrease the occurrence of low back pain<sup>14</sup>. The subjects with mechanical low back ache has a high incidence for recurrence rate if have a weak core musculature. Preferential retraining of the stabilizing muscles with their initial low-level isometric activation and their progressive integration into functional task, is proposed as an essential component of back muscle rehabilitation.

## MATERIAL AND METHODS

It was a quasi-experimental study, as randomization was not carried out, pre- & post-test were conducted. Eighty mechanical low back ache patients of both sex between 25-40years who had participated in the study were equally divided into the experimental group core muscle stabilization regimen and control group (Extension Maneuver). Patients with spinal deformities, spinal fracture, post spinal stabilization, infective spine are excluded from the study. Both core muscle stabilization regimen & extension maneuver, were given for a period of 4 weeks daily 1 hr. Patients in experimental group also receive back care, which include ergonomic advice and electrotherapy (short wave diathermy). Patients pain and disability were measured by Roland-Morris scale & visual analogue scale. Study variables were at zero weeks and at the end of every week of exercise.

### Procedure

80 patients with mechanical low back ache age group between 25 to 40 years both sex were included in this study. All the subjects participated in the inclusion and exclusion criteria after taking acceptance through consent form. As randomization is not-carried out, as it is Quasi-experimental study. 40 patients in each group equally participated in experimental group and control group. Pre -tests were carried out in each group, subjects were selected through pain and disability measured by Roland Morris questionnaire & Visual Analogue scale,

range of motion for lumbar spine, manual muscle testing for spinal flexors and extensors, muscle tightness for hamstring and quadriceps muscle, special test for lumbar spine to examine for mechanical low back ache subjects. In experimental group patients were treated with core muscle stabilization regimen and back care which includes ergonomic advice and electrotherapy modalities (Short Wave Diathermy) and control group with extension maneuver. The pain and disability were assessed by Roland-morris Questionnaire and visual analogue scale respectively for every one week of intervention program.

### Core muscle stabilization regimen:

Muscle activation of the deep core stabilizers (transverse abdominis and multifidus) co-ordinated with normal breathing patterns is the foundation for all core exercises.

- Warm-up in static cycling for 10mins.
- Supine bridging on swiss ball. Abdominal hollowing technique where a navel is drawn back toward the spine without spinal movement. Isometric contraction to transverse abdominals, 10seconds holding and 10 repetition.
- Prone bridging on swiss ball.
- Bird and dog exercise on swiss ball.
- Side planks.
- Back care program contains ergonomic advice and

electrotherapy (short wave diathermy for 15mins).

#### Visual analogue scale:

The visual analogue scale (VAS) is used to measure a perception or sensation that cannot easily or directly be measured. VAS assessed the amount of subjectively perceived pain across a pain continuum from none to extreme pain. Patients indicate pain levels by marking a point on the horizontal 10cm scale. Pain levels are characterized into 6 categories, each with 2cm increments no pain, mild pain, moderate pain, severe pain, very severe pain, and worst possible pain.

#### Roland Morris low back disability questionnaire:

The RDQ106 is a health status measure designed to be completed by patients to assess physical disability due to low back pain. It was designed for use in research, but has also been found useful

for monitoring patients in clinical practice. The RDQ is short, simple to complete, and readily understood by patients. These characteristics, along with evidence of its scientific validity, have led to its widespread use. The RDQ was derived from the Sickness impact pro-file (SIP), 3 which is a 136 item health status measure covering all aspects of physical and mental function. Twenty-four items were selected from the SIP by the original authors because they related specifically to physical functions that were likely to be affected by low back pain. Each item was qualified with the phrase “because of my back pain” to distinguish back pain disability from disability due to other causes a distinction that patients are in general able to make without difficulty. The RDQ score is calculated by adding up the number of items checked. Items are not weighted. The score therefore range from 0 (no disability) to 24 (maximum disability).

## RESULTS

TABLE-I

### DIFFERENCE BETWEEN TWO GROUPS I.E. EXPERIMENTAL AND CONTROL

	VAS Mean $\pm$ Std. Deviation	ROLAND-MORRIS LOW BACK PAIN Mean $\pm$ Std. Deviation
Pre-test	6.84 <sup>a</sup> $\pm$ 1.141	14.30 <sup>a</sup> $\pm$ 2.563
Week I	5.69 <sup>b</sup> $\pm$ 1.121	10.16 <sup>b</sup> $\pm$ 2.410

Week II	5.03 <sup>b</sup> ± 1.253	8.51 <sup>c</sup> ± 2.570
Week III	4.60 <sup>c</sup> ± 1.383	7.13 <sup>d</sup> ± 3.407
Test statistic & p-value	Chi-square = 206.498 p-value = 0.000*	F = 33.064 & p-value = 0.000*

**Note: Superscripts with same alphabet do not differ significantly and with different alphabets differ significantly**

The above Table 1 provides the descriptive statistics for VAS and RMDQ back pain scores with F-value and p-value for between groups test. Here we observe that for parameter 'Roland-Morris disability questionnaire low back pain' there exist a significant difference between the time periods considered.

Under repeated measures ANOVA, the important measure which tells us the difference between two groups. If this measure's value is near to zero, this means that there is a significant difference between two groups i.e.,

control and experimental. If this measure attains a value near to one or equal to 1, it indicates there is no difference between two groups. Hence for the data considered we found that for parameter Roland-Morris low back pain wilk's lambda value is 0.091 which indicates that there exists difference in the pain score among two groups.

Friedman test gives p-value is less than 0.05. Therefore, we can note that there is significant difference between the mean ranks of the related groups for the VAS score pain.

**TABLE 2: COMPARISON WITH RESPECT TO GENDER  
INDEPENDENT TEST**

Group	Gender	N	Mean ± Std. Deviation	t-test value & p-value
Roland-morris low back pain	Male	54	7.2778±3.03698	T = 0.455 p-value = 0.651 <sup>NS</sup>
	Female	26	6.9615±2.63030	
	Female	26	18.5385±7.91065	
VAS score	Male	26	2.3889±.85598	U= 516.000 p-value = 0.039*
	Female	54	1.9231±.93480	

This table provides useful descriptive statistics for the two groups male and female and also significant value. P-value was found to be greater than 0.05 in Roland Morris disability score, we can say that gender has no influence on reducing the pain score level.

Specifically, the table provides the test statistics, U-value, as well as the asymptotic significance p-value is less than 0.05 for VAS score, therefore we conclude that there is a statistical significant difference between the male and female groups with respect to VAS in reducing pain level.

**TABLE-III**  
**COMPARISON WITH RESPECT TO AGE GROUP**  
**ONE WAY**

		N	Mean ±Std. Deviation	Test statistics	p-value
Roland-morris Low back pain	< =29	17	73529±2.99877	F = 0.699	0.556
	30 - 34	22	6.5000±2.70361		
	35 - 40	20	7.1500±2.58080		
	41 +	21	7.7619±3.33024		
	Total	80	.1750±2.89817		
	Total	80	19.7625±10.32417		
VAS score	< = 29	17	1.8824±1.11144	Chi-square = 5.937	0.115
	30 - 34	22	2.0909±.68373		
	35 - 40	20	2.4500±.99868		
	41 +	21	2.4762±.74960		
	Total	80	2.2375±.90349		

The descriptive table provides some useful descriptive statistics including mean, standard deviation for the dependent variable for each separate age group. We also observe that the significant level is 0.556 for Roland-morris low back pain which are greater than 0.05 and, therefore, there is no impact of age group with respect to reduction in pain.

For comparisons with respect to age groups for VAS score we use Kruskal-Wallis test. The test statistics table presents the chi-square (Kruskal Wallis H) and the significance level. We report that there is no statistical difference for the pain score between the different age groups; i.e. age does not influence the pain score.

## DISCUSSION

Co-contraction of transverse abdominis and lumbar multifidus muscles is the basis of the lumbo-sacral biomechanic stability and that these muscles act by reducing the compressive overloads, attenuating or eradicating pain perception<sup>15</sup>. During exercise, secondary stability is provided by rectus abdominis and obliques muscles<sup>16</sup>. Both muscles are primary stabilizers of the lumbar segment, minimising compressive forces on spinal structures<sup>17</sup>. Core muscles provides dynamic stabilisation against rotational and translational stress in the lumbar spine during functional movements<sup>18</sup>.

The tightness in the hip muscles (psoas, quadriceps muscles) increases the

anterior shear force and compressive force at the L<sub>4</sub>-L<sub>5</sub> junction<sup>19</sup>. It also causes reciprocal inhibition of the gluteus maximus, multifidus, deep erector spine, internal obliques and transverse abdominis. This leads to extensor mechanism dysfunction during functional movement patterns<sup>20,21</sup>. From our study we found that maximum number of subjects having tightness in quadriceps and hamstring muscles.

## CONCLUSION

The study aims at explore the effectiveness of core muscle stabilization regimen in patients with mechanical low back ache. Eighty mechanical low back ache patients of both sex between 25-40 years participated in the study and were equally divided into the experimental group core muscle stabilization regimen and control group (Extension Maneuver). Patients with spinal deformities, spinal fracture, post spinal stabilization, infective spine are excluded from the study. Both core muscle stabilization regimen & extension maneuver, were given for a period of 4 weeks daily 1 hr. Patients in experimental group also received back care, which include ergonomic advice and electrotherapy (short wave diathermy). Patients' pain and disability were measured by Roland-Morris scale & visual analogue scale. Study variables were at zero weeks and at the end of every week of exercise. The data's were analysed statistically by Friedmann ANOVA, Mann Whitney u-test, t-test. The results concluded that

core muscle stabilization regimen is effective along with the spinal extension maneuver to reduce pain and to improve

functional ability of the lumbar spine in subjects with mechanical low back ache.

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