

ORIGINAL RESEARCH

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A COMPARATIVE STUDY TO FIND OUT THE EFFECTIVENESS BETWEEN CORE STABILIZATION VS MCKENZIE EXERCISES IN THE TREATMENT OF PATIENTS WITH MECHANICAL LOW BACK PAIN

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ABSTRACT

Background: Mechanical Low back pain is a leading cause of disability. It occurs in similar proportions in all cultures, interferes with quality of life and work performance. Both male and female populations are affected; however, there is a tendency towards a higher incidence in male patients. Mechanical low back pain is associated with pain and clinical instability in lumbar motion segments. Exercises play an important part in the rehabilitation of low back pain. The aim of this study was to compare the effectiveness between Core stabilization vs McKenzie exercises in the treatment of patients with mechanical low back pain.

Methods: 30 patients were selected between the age groups of 20 yrs to 50 yrs and having a past history of low back pain for one month. 15 patients were allotted to each group of experiment. Group I was given Core stabilization exercises and Group II with McKenzie exercises. Interferential therapy was a common treatment for both the groups. Evaluations of the subjects were done using the Revised Oswestry Disability Index and Dynamic Endurance tests.

Results: Data analysis revealed statistically significant difference between both the groups ($p < 0.05$) and proved that Core stabilization exercises is more effective than McKenzie exercises in mechanical low back pain.

Conclusion: This study shows that Core stabilization exercises possess a greater potential over McKenzie exercises in treating Mechanical Low back pain patients.

Keywords: Mechanical low back pain, Core stabilization exercises, McKenzie exercises, Neutral zone theory, Revised Oswestry Disability Index, Dynamic Endurance Tests

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INTRODUCTION

Low back pain is neither a disease nor a diagnostic entity. The term refers to pain of variable duration in an area of the anatomy afflicted so often that it has become a paradigm of responses to external and internal stimuli.^{1,2} The oldest history of back pain recorded dates back to 1500 B.C., which is documented in the surviving surgical text of Edwin Smith papyrus.³ The accurate, objective study of low back pain (LBP), its natural history, and its effective treatment is difficult because of the multiple factors involved.

The incidence of low back pain disability appears to have dramatically increased in western society since about 1970.^{4,5} For persons younger than 45 years, mechanical low back pain represents the most common cause of disability, and it is the third most common cause of disability in persons aged older than 45 years.⁶ Low back pain occurs most frequently in people between the ages of 20 years and 40 years.⁷ Both male and female populations are affected; however, there is a tendency towards a higher incidence in male patients.

According to the World Health Organization, Low back pain is a leading cause of disability. It occurs in similar proportions in all cultures, interferes with quality of life and work performance, and is the most common reason for medical consultations. Mechanical low back pain is defined as the pain that varies with physical activity (e.g., prolonged sitting, bending forward) and with time. The pain is located in the lumbosacral region, buttocks, and thighs, with no radiation to foot or toes.³ Physical therapy includes both passive and active treatments.^{8,9,10} The McKenzie approach and Core stabilization training are the two most dominant exercises programs used in low back rehabilitation and so, were included in the study.

METHODOLOGY

An experimental study design with two groups- Group-I: Core Stabilization Exercises group and Group-II McKenzie exercises group. As this study involved human subjects the Ethical Clearance was obtained from the Ethical Committee of Garden City College of Physiotherapy, Bangalore as per the ethical guidelines of Bio-medical research on human subjects. This study was registered under Rajiv Gandhi University of Health Sciences for subjects for registration for dissertation. Subjects included in the study were with a history of mechanical low back pain for at least one month, both male and female subjects, age between 20 – 50 years. The patients were diagnosed for the intended study by using the criteria for Mechanical low back pain as given by Gordon Waddell (1998).²

The criteria are pain is usually episodic, morning stiffness or pain is common, there is pain on forward flexion and often also on returning to erect position, pain is often produced or aggravated by extension, lateral flexion, rotation, standing, walking, sitting and exercises, pain usually becomes worse over the course of the day, pain is relieved by change of position especially when lying down or in flexed posture, low back pain lasting more than one day. Subjects were excluded with lumbar vertebral body fractures, Infection (e.g., epidural abscesses, peritonitis), Spondylolisthesis, Osteoporosis, Seronegative arthritic diseases (e.g., reactive arthritis, ankylosing spondylitis)

Subjects were recruited from Garden City College of Physiotherapy, Outpatient Department and I.T.I. Hospital, Bangalore. The study was conducted at Garden City College of Physiotherapy, Outpatient Department. Subjects who meet inclusion criteria were recruited by convenience sampling method using allocated subjects into two groups. Subjects who meet inclusion criteria were informed about the study and a written informed consent was taken. Group-I subjects received Core Stabilization Exercises and Group- II subjects received McKenzie Exercises. Interferential Therapy as conventional treatment was given for both the groups. Both groups subjects received intervention for 5 days in a week for 4 weeks. Total 30 Subject (n=30), 15 in each completed the studied.

Procedure of Core Stabilization Exercises:

The exercises were performed 3 series of 15 repetitions were done for each subjects, each exercise was performed with set of 30 times each. And then the exercises were performed in the next progressions once the present exercise is performed successfully.

The first stage of core stability training began with learning to activate the abdominal wall musculature. Base position Cue: Supine with knees bent and feet on floor; spine stabilized in neutral position with instructing the subject to get his “navel to spine”, also termed the Abdomen Hollowing exercise, the tummy tuck or Bracing the abdomen. Once the subject was through with this level of exercise the further progression were made with following exercises:

1. Unilateral leg extension while upper body prone on couch- The subjects were asked to keep the upper body prone on the couch and lift their legs alternately to the horizontal level and hold for 5 seconds.

2. Lifting hips up in bridged position- Patients were asked to hold the position for 5 seconds. This was progressed to unilateral knee extension while keeping hips in bridged position.
3. Dead Bug exercise- In supine position, the patients was advised to flex ipsilateral upper limb and lower limb and hold the position for 10 seconds. Process was repeated for the opposite side. The movements must be done slowly.
4. Bilateral leg extension in prone position- The patients were asked to lay prone position and lift the legs without bending the knees and hold the position for 5 seconds.
5. Superman exercise-The patients were asked to be in a 4 point kneeling position and straighten out one leg behind, keeping the trunk still and not twisting. The process was repeated with other leg. The progression of this was done by lifting opposite arm and leg.
6. Weights in hands and alternate shoulder flexion while standing straight - The patients were asked to stand straight while holding weights in the hands (women 1 kg, men 2 kg) with slightly flexed elbows, moving the weights up and down in frontal plane [40 times per minute.



Figure-1: Unilateral leg extension while upper body prone on couch



Figure-2: Lifting hips up in bridged position



Figure-3: Dead Bug exercise



Figure-4: Superman exercise

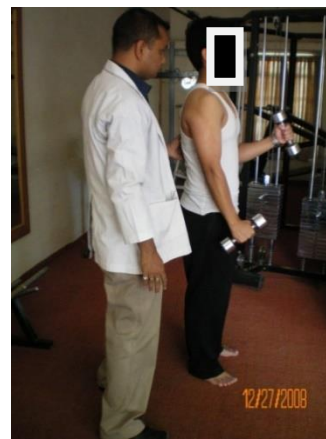


Figure-5: Weights in hands and alternate shoulder flexion while standing straight

Procedure of Mc Kenzie exercises:

The exercises were performed 3 series of 15 repetitions were done for each subjects, each exercise was performed with set of 30 times each. And then the exercises were performed in the next progressions once the present exercise is performed successfully.

1. Extension in prone lying: Patient was asked to lay prone with arms beside the body and head turned to one side and maintain the position for 4-5 minutes. In the same position, the patient was asked to place the elbows under the shoulders so that the patient lean on their forearms and maintain the position for 5 minutes. The patient was then advised to extend their elbows in the above position and push the top half of their body as far as the pain permits. The patient holds the position for a second or two and then comes back to the starting position. This was done ten times per session.
2. Extension in standing: The patient was asked to stand upright with feet slightly apart, hands placed at the back so that the fingers are pointed backward and the thumbs forward. The patient bends backward at the waist as far as they can keeping the knees straight, maintaining this position for a second or two and return to the starting position.
3. Flexion in supine lying: The patient was asked to lay supine with knees bent and foot placed on the couch. From this position the patient

brings both the knees towards the chest and gently but firmly pulls the knees with hands towards the chest till pain permits. The patient maintains this position for 1-2 seconds and returns to starting position.

4. Flexion in sitting: Patient sat on the edge of a chair with knees and feet well apart and hands resting in between legs. From this position the patient bends forward and returns back.



Figure-6-a, b and c: Extension in prone lying



Figure-7: Extension in standing



Figure-8: Flexion in supine lying



Figure-9: Flexion in sitting

Procedure of Interferential Therapy (IFT) 79

The parameters that were used for the treating the subjects was: Machine: Vectrotrim. Method: Interferential Vector method. 4 electrodes 90° rotating vector. Frequency: 80-100 Hz. Intensity: Depending on the patient's sensitivity, intensity was adjusted. Wave form: Trapezoid. Time: 10 to 15 minutes. Electrode placement: Cross fire method, over the low back.

Outcome Measurements:

Each subject was assessed using Revised Oswestry Disability Index prior to the treatment, at the end of the 2nd week, and at the end of 4th week of treatment. The endurance level was assessed using the Dynamic Extensor Endurance test for trunk extensor and the Dynamic Abdominal Endurance test for trunk flexors prior to the treatment and post treatment.

The Revised Oswestry Disability Index (Revised ODI)

It is a questionnaire designed to assess low back pain/dysfunction. This is a self-reported 10 – section questionnaire, each section has 6 possible answers. Statement 1 is graded as 0 points; statement 6 is graded as 5 points. The sections are organized by type of activity and followed by six different assertions expressing progressive levels of functional capabilities. The sections are Pain intensity, Personal Care, Lifting, walking, sitting, standing, sleeping, social life, and travelling, changing degree of pain. Subjects were instructed to complete all the sections in one sitting without leaving it blank. Total score is expressed as percentage (by dividing total raw score by 50 and multiply by 100). If the score is decreasing then disability is reduced. The following interpretation of disability scores is excerpted from the developers of the Oswestry system : 0%-20%: Minimal disability, 20%-40% Moderate disability, 40%-60%: Severe disability, 60%-80%: Crippled, 80%-100%

Dynamic Abdominal Endurance Test

The patient was asked to lie supine with the hips at 45°, knees at 90° and hands at sides. An 8 centimeter line for patients over 40 years of age and a 12 cm line for below 40 years of age was drawn distal to the fingers. The subject was asked to tuck the chin in and curl the trunk to touch the line with the fingers. The number of repetitions possible before the onset of fatigue was taken into consideration.

Dynamic Extensor Endurance Test

This test was done by placing the patient in prone lying with hips and iliac crests resting on the end of the examination table. The hips and pelvis were

stabilized with straps. Initially the patient's hands supported the upper body in 30° flexion on a chair. Keeping the spine straight the patient was instructed to extend the trunk to neutral and then come back to the starting position. During the test, the patient's arms were crossed at the chest. The number of repetitions possible before the onset of fatigue was taken into consideration.

Statistical Methods

Descriptive statistical analysis was carried out in the present study. Out Come measurements analyzed are presented as mean ± SD. Significance is assessed at 5 % level of significance with p value was set at 0.05 less than this is considered as statistically significant difference. The statistical tool used for the study is repeated measures with Analysis of Variance using One Way Classification. In repeated measures experiments, the first step is to obtain descriptive statistics. These provide some idea of the distributions of the variables as well as their average values and dispersions. These contains cell means and standard deviations, as well as individual confidence intervals, for the latency times. The Statistical software namely SPSS 16.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

The study was conducted on 30 Mechanical low back patients who were given physiotherapy treatment for four weeks. The effects of the treatment on each subject were evaluated using Revised Oswestry Disability Index and Dynamic endurance test (Dynamic Abdominal endurance test and Dynamic Extensor endurance test).

Data analysis revealed that the before treatment mean score of Revised ODI for Group I (63.07 ± 7.55) was reduced to (37.87 ± 8.26) at the end of second week of treatment and which further decreased to (22.53 ± 5.93) in the end of the fourth week when compared to Group II as their base line mean score of Revised ODI (58.33 ± 7.77) decreased to (40.67 ± 8.02) at the end of second week of treatment and it further decreased to (23.33 ± 4.88) in the end of the treatment. Thus, statistically there is a significant difference between both the groups and Group-I is more effective than Group-II in Revised ODI.

Two evaluations were performed for the Dynamic Abdominal and Dynamic Extensor endurance test i.e. Before treatment, after treatment (end of fourth week). The Mean Difference score for Dynamic abdominal Endurance test of Group I was (6.06 ± 0.88) compared to Group II which was

(5.26 ± 0.59) and the Mean Difference score for the Dynamic Extensor Endurance test of Group-I was (4.86 ± 0.99) and that of Group-II was (4.06 ± 0.96). This shows statistically a significant difference between the groups and proves that Group-I which was treated with Core stabilization exercises is more effective and there was a clinically significant decrease in pain and an increase in trunk muscle endurance (abdominal and extensors) percentage.

From the table there is highly significant difference ($P < 0.05$) by using repeated measure of ANOVA with one way classification.

Table-1: Comparison of means of Revised Oswestry Disability Index between Group-I and II

	Group-1 (Mean ± SD)	Group-2 (Mean ± SD)	Repeated measure of ANOVA for between the group	
			F	P value
prior to the treatment	63.07 ± 7.55	58.33 ± 7.77	442.02	0.002**
at the end of the 2nd week	37.87 ± 8.26	40.67 ± 8.02		
at the end of 4th week of treatment	8.26 ± 5.93	27.33 ± 4.88		

** Statistically Significant difference $p < 0.05$; NS- Not significant

Graph-1: Comparison of means of Revised Oswestry Disability Index between Group-I and II

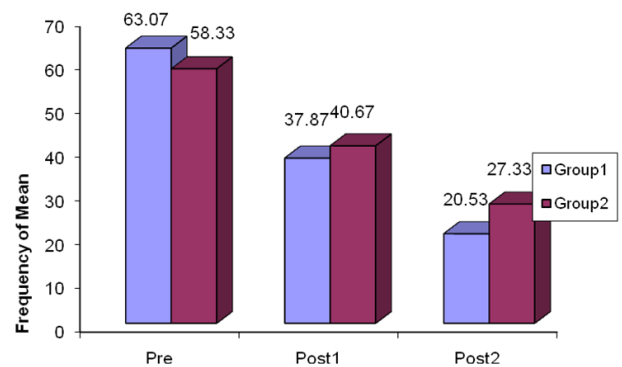


Table-2: Comparison of means of Dynamic Abdominal Endurance between Group-I and II

	Group-1 (Mean ± SD)	Group-2 (Mean ± SD)	Independent Sample T-test between Group I vs. Group II	
			t- value	P value
Mean difference	6.0667 ± 0.8837	5.2667 ± 0.5936	2.910	0.007**
Standard Error of mean	0.2282	0.1533		

** Statistically Significant difference $p < 0.05$; NS- Not significant

Graph-2: Comparison of means of Dynamic Abdominal Endurance between Group-I and II

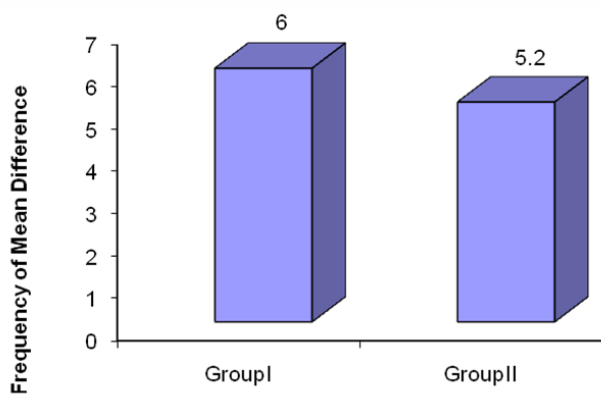
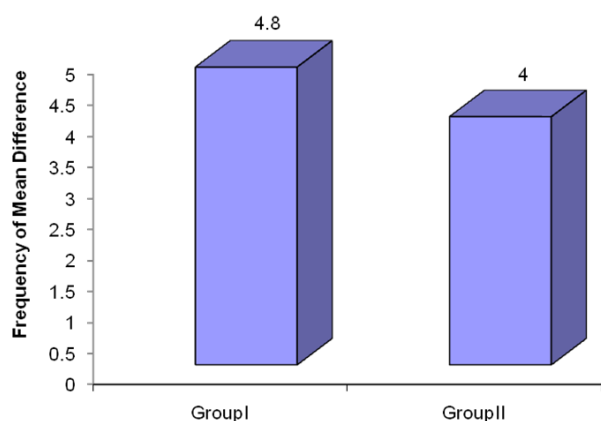


Table-3: Comparison of means of Dynamic Extensor Endurance test between Group-I and II

	Group-1 (Mean ± SD)	Group-2 (Mean ± SD)	Independent Sample T-test between Group I vs. Group II	
			t- value	P value
Mean difference	4.8667 ± 0.9904	4.0667 ± 0.9612	2.245	0.033**
Standard Error of mean	0.2557	0.2482		

** Statistically Significant difference $p < 0.05$; NS- Not significant

Graph-3: Comparison of means of Dynamic Extensor Endurance test between Group-I and II



DISCUSSION

Mechanical low back pain is described as a musculoskeletal pain which varies with physical activities and not involving root compression or serious spinal diseases. Spine is the main structure which carry load, allow movements and protect the spinal cord. The necessities of this spine to be rigid and flexible conceptualize the idea of spinal stability. Spinal stability is formed by active, passive and neural subsystems. In mechanical low back pain there will be increased alteration in these systems.

In the present study patients between the age groups of 20 yrs to 50 yrs and having a past history

of low back pain for one month were included. A comparison has been done on the effectiveness of two active therapies i.e. Core stabilization exercises and McKenzie exercises in patients with mechanical low back pain. Interferential therapy was the common treatment for both the groups. The duration of the treatment was four weeks. At the end of the treatment program (fourth week) both the groups showed improvement in pain score and in trunk endurance level measured with Revised ODI and Dynamic Endurance tests (abdominal and extensor) respectively.

Data analysis revealed that the before treatment mean score of Revised ODI for Group I was reduced at the end of second week of treatment and which further decreased in the end of the fourth week when compared to the score of Group II. Two evaluations were performed for the Dynamic Abdominal and Dynamic Extensor endurance test before and the after treatment (end of fourth week). The Mean Difference score of Dynamic Abdominal and Dynamic Extensor test for Group I was high than Group II.

Statistical analysis revealed that there was a significant difference ($p < 0.05$) between the groups and proved that Core stabilization exercises was more effective than McKenzie exercises in the treatment program which was supported by previous studies done by Desiree Lie (May 2006) where he found that spinal stabilization was beneficial for low back patients.¹¹ Also a study done by Goldby et.al where patients were randomized to manual therapy and for a 10 week spinal stabilization rehabilitation program and the results indicated statistically significant improvements in favor of the stabilization group¹² these exercises will improve co-contraction of both abdominal and extensors of spine which improves stabilization.^{13,14,15}

CONCLUSION

This study is intended to compare the effectiveness between Core stabilization and McKenzie exercises in the treatment of patients with Mechanical low back pain. For the study, 30 patients were selected with convenience sampling technique. Interferential therapy was a common treatment for the both the groups. Pain and Endurance level was scored by Revised Oswestry Disability Index and Dynamic Endurance tests (abdominal and extensor). From the study it was concluded that Core stabilization exercises proved to be more effective than the McKenzie exercises in reducing pain and increasing the endurance level in the treatment of patients with Mechanical low back pain.

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Conflicts of interest: None

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