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Effectiveness of Mckenzie's Exercises and Intensive Spinal Strengthening Program on Patients with Subacute or Chronic Low Back Pain- A Comparative Study

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Abstract

Background: Low back pain (LBP) is a prevalent musculoskeletal disorder affecting a significant portion of the global population, with chronic cases leading to prolonged disability. McKenzie exercises and intensive spinal strengthening programs are commonly used interventions, but their comparative effectiveness remains debated.

Objective: This study aimed to compare the efficacy of McKenzie exercises versus intensive spinal strengthening exercises in reducing pain and disability in patients with subacute or chronic LBP when combined with conventional therapy (interferential therapy and traction).

Methods: A randomized comparative study was conducted with 60 participants (aged 30–50 years) divided into two groups. Group A received McKenzie exercises, intermittent lumbar traction, and interferential therapy (IFT), while Group B received intensive spinal strengthening exercises, traction, and IFT. Pain intensity was measured using the Visual Analog Scale (VAS), and disability was assessed via the Modified Oswestry Disability Questionnaire. Outcomes were evaluated before and after a 4-week intervention.

Results: Both groups showed significant improvements in pain and disability ($p = 0.001$). However, Group A (McKenzie) demonstrated greater reductions in pain (mean decrease from 8.0 to 3.0 on VAS) and disability (60% to 22%) compared to Group B (pain: 8.0 to 5.0; disability: 55.5% to 34%). Intergroup analysis revealed McKenzie exercises were significantly more effective ($p = 0.002$).

Conclusion: McKenzie exercises combined with conventional therapy are more effective than intensive spinal strengthening programs in alleviating pain and improving functional outcomes in subacute/chronic LBP patients. Further studies with larger samples and longer durations are recommended to validate these findings.

Keywords: Low back pain, McKenzie method, spinal strengthening exercises, interferential therapy, lumbar traction, disability management.

Introduction

Low back pain is a common musculoskeletal problem, not only affecting the individual sufferer but also society in general. In fact, 80% of population in world will suffer from at least one episode of low back pain in their lifetime, most frequently in people between the ages of 20 to 50 yrs, but more common in older age group. Chronic Low back pain is the second most common ailment affecting a large percentage of population lasting for >3months. Although community surveys indicate that the incidence of low back pain is higher in females than males' industrial surveys demonstrate the reverse.

It is also second most common cause of disability in US adults and a common reason for lost work. Recurrences of low back pain are also common with the percentage of subsequent low back pain episodes ranging from 20% to 44% within 1 year for working populations to lifetime recurrences of up to 85%. Data from England suggest that the prevalence of low back pain has increased substantially over the past several decades.

In India, prevalence of low back pain is nearly 60 per cent of the population who have significant back pain at some time in their lives which is far behind the prevalence in other countries such as U.S where it is 70-85 percent. This could be due to non-report of the individuals to seek medical service. The low back pain can be classified into:

a) Acute Low Back Pain (less than 6 weeks duration of pain.
b) Subacute Low Back Pain (6 weeks to 12 weeks. duration of pain).
c) Chronic Low Back Pain (Pain duration of 12 weeks and above).

Most subjects with chronic low back pain are treated with anti-inflammatory medications and exercises with or without other alternative therapeutic modalities include continuous/intermittent traction, shortwave diathermy, transcutaneous electrical nerve stimulation, interferential therapy, superficial heat, mobilization, and manipulation. Numerous studies have been done on the effects of intermittent lumbar traction. Its mechanical effects result in joint distraction, reduction of disc protrusion, soft tissue stretching, muscle relaxation, joint mobilization. The role of Conventional therapy in alleviating pain and improving functional status of low back pain patients is debatable.

Current physiotherapy management encompasses both evidence-based treatments like McKenzie, General strengthening exercises along with other forms of conventional therapies. The McKenzie method is a popular treatment for Low Back Pain among physical therapists. The goal of McKenzie therapy is to centralize the pain i.e. move the pain from the leg into the low back, as low back pain is generally better tolerated than leg pain. A key aspect of the McKenzie approach is that the patients receive individualized treatment based upon their clinical presentation. McKenzie noticed specific patterns of response to the loading assessment based on which he categorized the patient's condition into different syndromes.

a) Postural syndrome.
b) Dysfunction syndrome.
c) Derangement syndrome.

McKenzie exercises centralizes & reduces pain by decreasing the derangement, thereby releasing the compression on the nerves and assists in regaining normal posture by improving & maintaining the lordotic curve. It also assists in increase of lumbar flexion and extension by stretching the tightened structures of the lumbar spine.

Intensive Spinal Strengthening Exercises is a supervised & graded therapy program which was designed to improve the strength of key spinal Stabilizers (abdominals and back

muscles) through activation & building strength which helps in decreasing the stress & abnormal loads on the spine by improving posture. These exercises also help in retraining the deep muscles, enhances the endurance of paraspinal and abdominal muscles via repetitions. These exercises insist on proper Neuromuscular Control and Coordination which are essential for proper maintenance of body mechanics and posture when it is required to carry a load and to perform common daily activities. These exercises will give an improvement in gliding of the apophyseal joints, which results in the improvement of flexion and extension activity thereby improving the activities of daily living (ADL).

Conventional therapy comprising of IFT and Intermittent lumbar traction are widely recommended for low back pain patients. IFT is credited with the ability to reduce the pain by stimulating the pain gate mechanisms thereby inhibiting the pain pathways at dorsal horn of the spinal cord and Peri Aqueduct Grey matter of the brain stem masking the pain symptoms whereas Traction helps in reducing the size of the herniations, increases space within the spinal canal, widens the neural foramina, and decreases muscle guarding providing relaxation of the back muscles.

However, the superiority of any mobilizations / manual therapies or specific exercise protocols over one another is not well established. Randomized studies indicate that the efficacy of the specialized exercises (McKenzie Exercises, and Intensive Spinal Strengthening Program etc.) in treatment of patients with Sub acute and Chronic Low Back Pain when used in isolation is debatable. We assumed that addition of McKenzie Exercises or Intensive Spinal Strengthening Program to the Conventional Therapy (IFT &Traction) will assist in reduction of Pain and Disability in patients with sub-acute /chronic low back pain due to their effects & advantages.

Hence, in this study an attempt is made to compare the effectiveness of McKenzie with spinal strengthening exercise in relieving pain & improve functional level along with simultaneous use of conventional exercises.

Hypothesis

Effects of TENS are primarily to modulate the pain irrespective of the causative factor, whereas effects of traction could either partly or completely modify the etiological factors so intermittent lumbar traction could be more effective in subjects with chronic nonspecific low back pain.

Aims & Objectives of the Study

To compare the effectiveness of McKenzie exercises compared to intensive spinal strengthening exercises in subjects with chronic mechanical low back pain.

Material & Methodology

Source of Data: Department of Physiotherapy

Sample Size: Sixty subjects were selected for study.

Sample Design: Convenient sampling method was adopted for the study and then the subjects were allocated to one of the study groups (Group-A: McKenzie exercise, intermittent lumbar traction & I.F.T) & (Group-B: spinal strengthening exercises, intermittent lumbar traction & I.F.T).

Research Design: Experimental design, comparative in nature.

Inclusion Criteria: Both males and female subjects aged between30-50 years with complain of pain more than six weeks duration(chronic) were selected for study.

Exclusion Criteria: Subjects were excluded if they had symptoms of severe osteoporosis or Spondylolisthesis, any kind of spinal fractures, referred pain from viscera, malignancy/ tumors pregnancy.

Instrumentation and Tools Used:

- Motorized Traction unit fitted with split bed
- Interferential Therapy machine
- Swiss ball
- Treatment couch
- Aqua-sonic gel
- Visual analog Scale
- Modified OSWESTRY low back pain disability questionnaire

Duration of Study: 4 weeks

Intervention Protocol

Intervention Protocol-Out of 60 subjects, 30 subject in group -A were given TRACTION, I.F.T & McKenzie Exercise (Flexion Type & Extension Type) and 30 subject in group-B were given TRACTION, I.F.T & intensive spinal strengthening exercise.

For Group-A:

Group-A(n-30) receive intermittent lumbar traction on a split bed for a duration of 20 minutes with a hold time of 40 seconds and relaxation time for 5 seconds at a force(load) of 1/3rd of subject's body weight [M.H Cameron-2003] & interferential therapy with 4KHz, frequency of 100Hz with duration of 15 minutes.

McKenzie Exercise (According to R.A McKenzie)

Flexion Type

Flexion in lying was performed up to 10 repetitions per day with 10 excursions per repetition and the position must be maintained for two second. Flexion in standing was performed up to 10 repetitions per day with 10 excursions per repetition and the position must be maintained for two second. Flexion in step standing was performed up to 6 repetitions per day with 10 excursions per repetition and the position must be maintained for two second.

Extension Type

Lying prone in extension was performed up to 5 repetitions per day with 10 excursions per repetition and it should hold for two seconds. Extension in lying is done with 10 repetitions per day with 10 excursions per repetition & it should maintain for two second. Extension in standing is done for 10 repetitions per day with 10 excursions per repetitions & it should maintain for two minutes.

For Group-B:

Group-B(n-30)) receive intermittent lumbar traction on a split bed for a duration of 20 minutes with a hold time of 40 seconds and relaxation time for 5 seconds at a force(load) of 1/3rd of subject's body weight [M.H Cameron-2003] & interferential therapy with 4KHz, frequency of 100Hz with duration of 15 minutes.

Intensive spinal strengthening exercise (Kisner, Therapeutic Exercise)

Warm up: Warm up exercises are the first elements in any exercise routine. The warm up period should last between 10 minutes (According to Kisner, page no: 160-161 therapeutic exercise) and followed by stretching and these exercises are: -

Bicycling: should do for 10 minutes prior to exercise.

Back stretching: should do twice before and twice after strengthening exercise with 30 second holding time (According to Bhavini Dhanji, page-158)

Exercises: (According to Bhavini Dhanji)

Trunk Curl: should perform for 10 repetitions with 5 second hold.

Pelvic Tilt- should do for 10 repetitions with 10 second hold.

Quadruped with arm & leg raising- for 10 repetitions with 5 second hold.

Back extension using exercise ball- for 10 repetitions with 5 second hold.

Method of Data Collection:

To find out the difference in outcomes visual analog scale and Modified Oswestry low back pain disability questionnaire were employed.

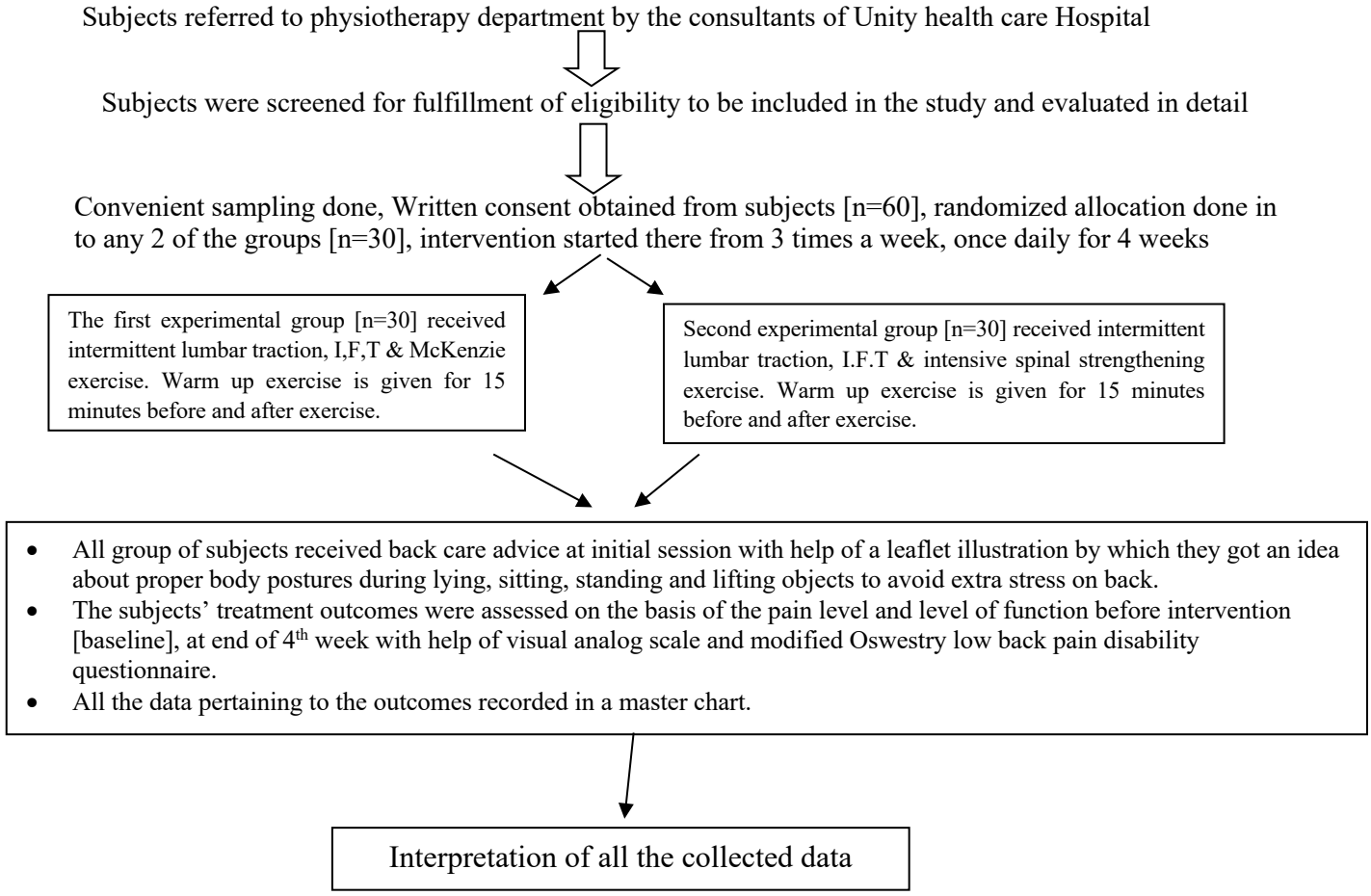
Selection of Tool:

VAS, Modified Oswestry low back pain disability questionnaire are internationally standardized and highly reliable tool for quantifying pain and disability respectively.

A Visual Analogue Scale (VAS) is a measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured. For example, the amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain. From the patient's perspective this spectrum appears continuous; their pain does not take discrete jumps, as a categorization of none, mild, moderate, and severe would suggest. It was to capture this idea of an underlying continuum that the VAS was devised.

Oswestry low back pain disability questionnaire is designed to give examiner information as to how the back pain has affected patient's ability to manage in everyday life. Ten sections or items assess pain, personal care, lifting, walking, sitting, standing, sleeping, social life, travelling and employment.

Flow-Chart about Stepwise Procedures



Result

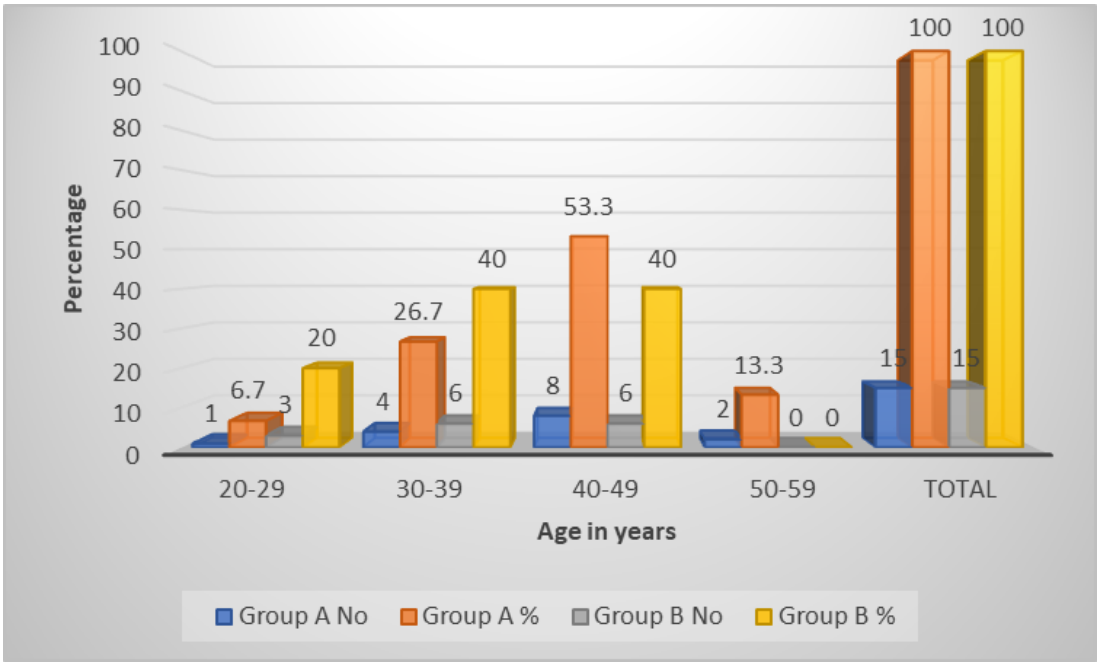
Result Tables & Graphs:

Results are presented in Mean ± SD (Median), delta values, p values & Effect size.

Comparison of age in years

Table 1

Age in years	Group A		Group B	
	No	%	No	%
20-29	1	6.7	3	20.0
30-39	4	26.7	6	40.0
40-49	8	53.3	6	40.0
50-59	2	13.3	0	0.0
Total	15	100.0	15	100.0
Mean ± SD	41.13±6.93		36.27±9.38	



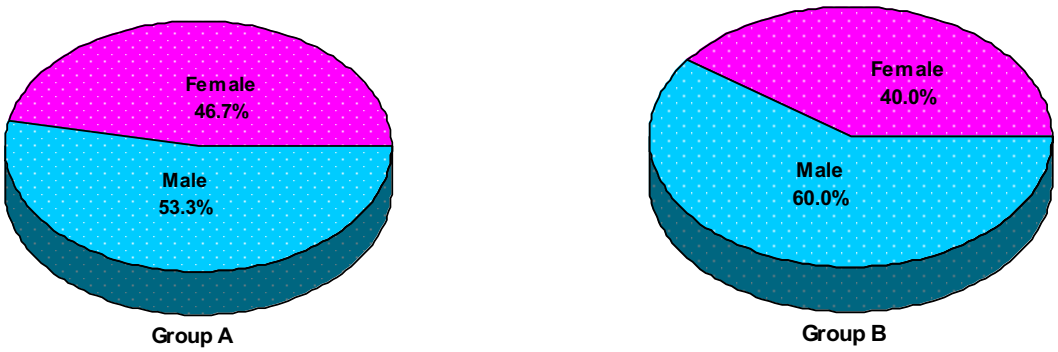
Graph: 1

The average Age in Group 'A' was 41.13±6.93 years & Group 'B' was 36.27±9.38. Samples are age matched with p=0.117

Comparison of Gender

Table 2

Gender	Group A		Group B	
	No	%	No	%
Male	8	53.3	9	60.0
Female	7	46.7	6	40.0
Total	15	100.0	15	100.0



Graph: 2

The subjects were found to be gender matched with p=0.713

Comparison of Pre-intervention outcome variables in two groups of patients

Table 3

Out-come variables	Group 'A'	Group 'B'	Significance
VAS	8.27±0.70 (8.0)	8.13±0.92 (8.0)	0.838
ODI	59.59±12.30 (60.0)	56.75±20.08 (55.5)	0.567

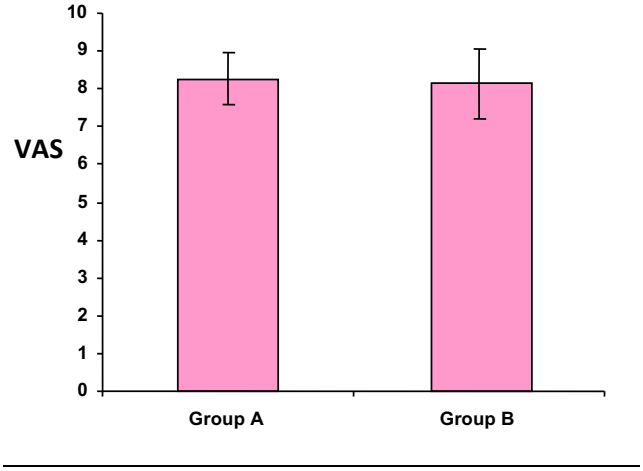


Figure 3a

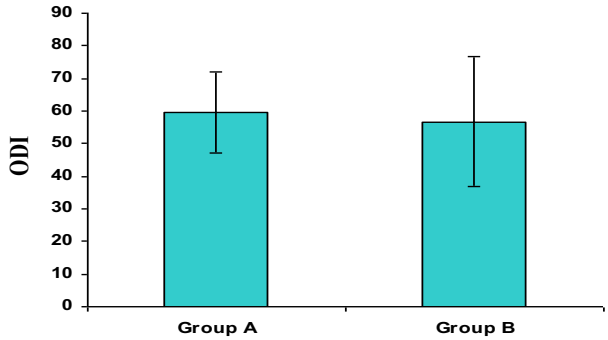


Figure 3b

Pre intervention comparison in both the groups is evenly matched with p=0.838 of VAS and p= 0.567

Evaluation of outcome variables in Group A

Table 4

Out-come variables	Pre-intervention	Post-intervention	delta	p value	Effect size
VAS	8.27±0.70 (8.0)	3.67±1.68 (3.0)	4.60±1.35 (5.0)	0.001**	3.88(VL)
ODI	59.59±12.30 (60.0)	26.66±15.18 (22.20)	32.93±12.58 (34.0)	0.001**	2.39(VL)

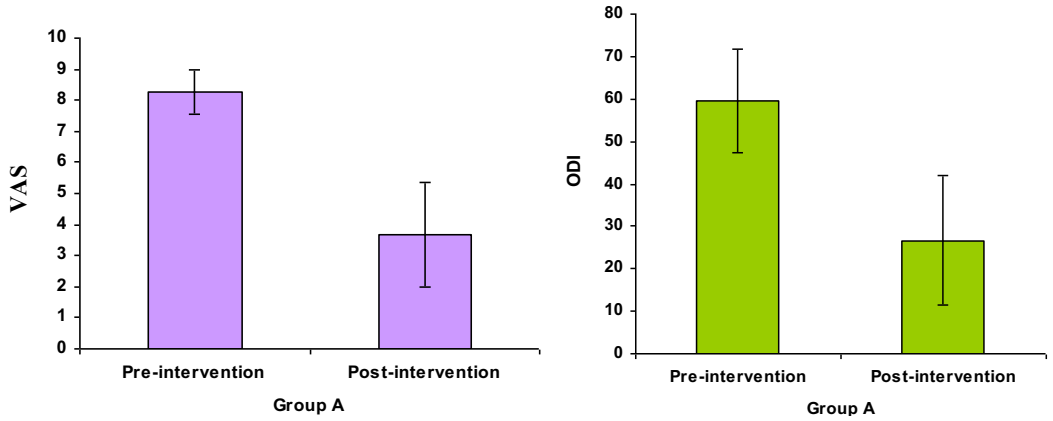


Figure 4 a & b

Evaluation of outcome variables in Group B

Table 5

Out-come variables	Pre-intervention	Post-intervention	delta	p value	Effect size
VAS	8.13±0.92 (8.0)	5.33±1.63 (5.0)	2.80±1.26 (3.0)	0.001**	2.19(VL)
ODI	56.75±20.08 (55.5)	37.88±16.78 (34.0)	18.87±8.98 (17.8)	0.001**	1.02(:L)

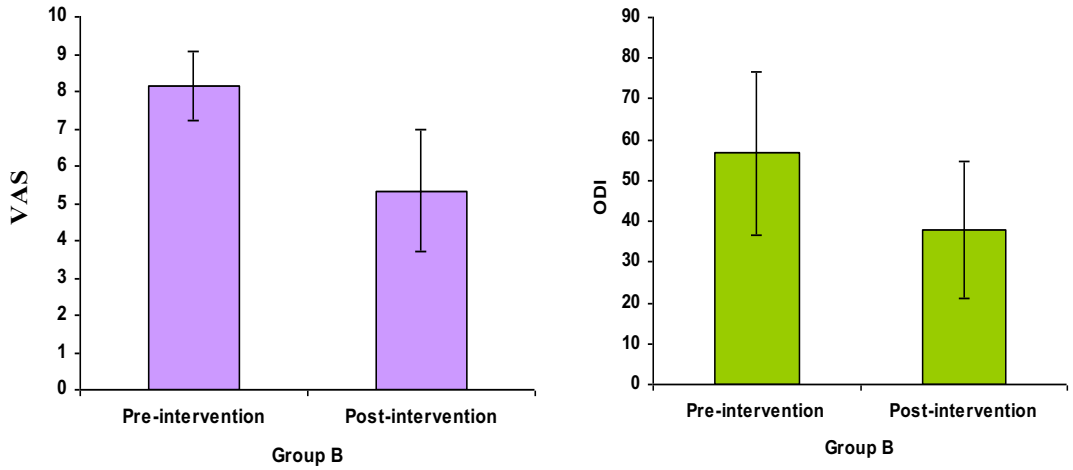


Figure 5 a & b

Evaluation of outcome variables of VAS & ODI in Group 'A' & 'B' shows significant difference with p= 0.001

Comparison of outcome (delta) in 2 groups of patients

Table 6

Delta values	Group A	Group B	P value	Effect size
VAS	4.60±1.35 (5.0)	2.80±1.26 (3.0)	0.002**	1.34 (VL)
ODI	32.93±12.58 (34.0)	18.87±8.98 (17.8)	0.002**	1.25 (VL)

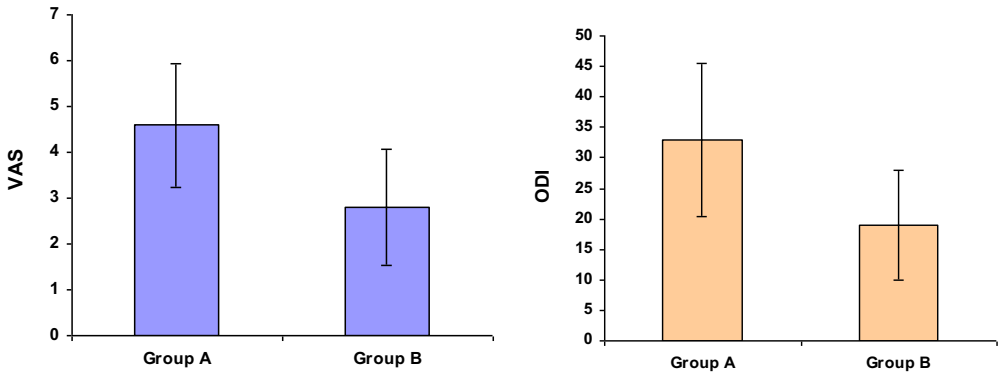


Figure 6 a & b

Fig: 6 a

Comparison of VAS & ODI delta values shows significant improvement in group 'A' with p=0.002.

Results: The results of the study showed significant difference in reduction of Pain and Disability in favor of the McKenzie group at the 2 weeks follow-up assessment (P = 0.002).

Data Analysis

Statistical Methods: Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. Mann Whitney U test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between groups. Wilcoxon Signed rank test has been used to find the significance of pre- and post-

Fig: 6 b

intervention of outcome variables with in each group. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

+ Suggestive significance (P value: $0.05<P<0.10$)

* Moderately significant (P value: $0.01<P \leq 0.05$)

** Strongly significant (P value: $P \leq 0.01$)

Statistical software: The Statistical software namely SPSS 15.0, 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.

Discussion

The objective of the study was to compare the effect of the McKenzie exercises treatment method with that of Intensive Spinal

Strengthening Program in patients with Subacute / Chronic low back pain.

The results of the study showed significant improvement in reduction of Pain & Disability in both the groups with a mean decrease of pain from 8.0 to 3.0 (p=0.001) & disability 60% to 22%. (p=0.001) in McKenzie group. Whereas group 'B' (Intensive Spinal Strengthening Program group also showed significant differences in the mean Pain from 8.0 to 5.0 (p=0.001) and Disability from 55.5% to 34% (p=0.001).

The reduction of Pain and Disability outcome measures in both the groups found in our study concurs with similar findings by Helen A Clare, et al, Rolsted Hansen, et al. & Manniche et al.

The findings of our study are contrary to the study done by Petersen et al. as we perceive that the intensity of training was low in their study where only 8 sessions of treatment was given over a period of 2 months. The current study may have shown improvement not only due to continuous nature of treatment sessions i.e. daily for 2 weeks but also due to addition of conventional therapy which is concurrent with the study of Hurley et al.

In the present study, when inter group comparisons are made, Group 'A' which received McKenzie exercises and Conventional Therapy (IFT & Traction) showed significant improvements than Group 'B' which received Intensive Spinal Strengthening Program and conventional therapy (IFT & Traction) after 2 weeks (p=0.002).

The significant improvements in group 'A' may be because of Centralization of pain from periphery and unloading mechanism as reported by Susan C. Slade & Jennifer L. Keating. leading to decrease in the derangement, thereby releasing the compression on the nerves. This also results in regaining normal posture by improving and maintenance of the lumbar lordotic curve.

Subjects with Subacute / Chronic Low Back Pain were relieved of pain which was present in back or in leg because of centralization of pain which was caused by Mc Kenzie exercises and this is in concurrent with findings of Gard G, et al. (2000)

The significant improvements of Pain and Disability seen in Intensive Spinal Strengthening Program group could have been because of the retraining of the stabilizing muscles, with their initial low – level isometric activation and their progressive integration into functional tasks. This is achieved by strengthening of the abdominal muscles and multifidus muscle which stabilize the lumbar segment. Rolsted Hansen, et al.

Improvement in pain and disability may also be due to improvement in strength, endurance of core musculature of lumbar spine. This helps in decreasing the stress & abnormal loads on the spine by demanding a proper Neuromuscular Control and Coordination which are essential for maintenance of body mechanics and posture when it is required to carry a load and to perform common daily activities.

IFT stimulate the pain gate mechanisms & thereby mask the pain symptoms, whereas Traction leads to reduction of the size of the herniations, increased space within the spinal canal, widening of the neural foramina, and decreased muscle guarding providing relaxation of the back muscles. Table 6 displaying the values for inter group comparisons of the delta (p=0.002), indicate that Group 'A' has significantly improved in pain and disability outcome measures compared to group 'B'. The results are in agreement with the review done by

yes	platform+medline	author
author		

Susan C. Slade & Jennifer L. Keating.

Despite randomization, base line parameters of Age in both the groups were unequally distributed (Table 1). The subjects in the McKenzie exercise Group had higher mean age (41.13±6.93) than the Intensive Spinal Strengthening Group (36.27±9.38). Despite these discrepancies in the demographic data relating to age the McKenzie exercises group showed significant improvements in all the parameters assessed.

This also suggests that the McKenzie exercises are very effective & safe even in older population. This may be attributed due to unloading movement patterns of McKenzie exercises in which the energy consumption is less than Intensive Spinal Strengthening Program.

Hence it can be safely be assumed that addition of McKenzie exercises as an adjunct to Conventional Therapy in the management of Subacute & Chronic low back pain will lead to better recovery rates than using Intensive Spinal Strengthening Program.

Strengthening of muscles in Low back pain by Intensive Spinal Strengthening is effective but to have a significant effect on Pain, Disability levels and to achieve higher level of functional performance McKenzie exercises are better in patients with Subacute / Chronic Low Back Pain.

Conclusion

The McKenzie exercises is more effective in improving Pain and Disability than Intensive Spinal Strengthening Program when used as an adjunct to Conventional treatment of patients with Subacute / Chronic Low Back Pain.

Summary

The study was a randomized control trial, where 30 subjects with Low Back Pain of Subacute/Chronic durations were selected with age group of 18 to 60. The subjects who fulfilled inclusion and exclusion criteria were selected randomly for the study and divided into two groups (A & B). 15 subjects were assigned to each group where Group 'A' received treatment by Mc Kenzie's Exercises and Conventional Therapy (IFT & Traction) and Group 'B' received Intensive Spinal Strengthening Program. The subjects were explained about the treatment, experimental procedures, and outcome measures and were requested to fill the consent form. They were assessed for their intensity of Pain by VAS and Disability function through Oswestry Disability Index before and after the therapy sessions. The pre and post values of pain & disability outcome measures were compared.

Mann Whitney U Test, Student 't' Test & Chi Square Test was used for statistical analysis and the results of the study showed significant improvement in reduction of pain & disability in both the groups (p=0.001). When inter group comparisons are made Group 'A' showed greater & significant improvements than Group 'B' after 2 weeks of therapy sessions (p=0.002).

Therefore, this study concluded that both the approaches are effective for decreasing pain and improving functional ability of patients with LBP. But when these two groups are compared with each other, the Mc Kenzie's exercises were found to be more effective therapy than Intensive Spinal Strengthening program in relieving pain and improving functional ability of patients with sub-acute / chronic LBP in short term duration.

Limitations & Suggestions

- The study was done on a small sample; further studies need to be done on large sample.
- This study was a short duration study of 2 weeks. Further study should be done for longer duration.
- Further research based on the current study should include different methods of exercising the lumbar stabilizers which will aid in making the exercise program more challenging for patients.

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