

Research article

Effect of trunk muscle endurance training in pain management and function in sub-acute low back pain – A quasi experimental study

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ABSTRACT

Introduction and Aim: Low back muscle endurance is becoming a major issue because of low back ache. Though many treatment protocols have been suggested and proved effective, endurance exercises have been under less researched area over its effectiveness in comparison to other treatment protocols. The purpose of this study is to determine the effect of trunk extensor muscle endurance training with conventional spinal exercise for trunk extensor muscle in subjects with LBP.

Materials and Methods: This is a quasi-experimental study involving 56 patients in the age group of 25-35 years who were allocated in the experimental group (endurance exercises) and control group (conventional spinal exercise) for 3 times per week, for 6 weeks for a duration of 30-45 minutes. Outcome measures used for the study were McGill Pain Questionnaire, RMDQ, 60 sec. spinal extension endurance tests.

Results: There was no significant difference found within group analysis in all outcome measures. In between, the group analysis experimental group has shown statistically significant difference in all outcome measures at post-test with the p-value of 0.000.

Conclusion: Endurance training has proved to be a much more effective method and provides faster recovery than conventional spinal extension exercise in treatment of patients with subacute low back pain.

Keywords: Low back ache; endurance exercises; Roland Morris disability questionnaire (RMDQ).

INTRODUCTION

Low back pain (LBP) is one of the commonest pains managed by physiotherapist globally (1). There are various schools of thoughts and evolution that has happened in the past due to advancement of knowledge and understanding of pain mechanism in LBP management. But one intervention that had always been in the popular weapon and one of the most effective tools in pain management of lumbar spine is the exercises (2). There have been various types of exercises, various frequencies and various equipment being employed in administering exercises. Ultimately the muscle has been the main focus off late in the management of Low Back Ache (LBA). There are various component and property of the low back muscle being attested in the past which exercising. The most common component that has been associated with LBA is the strength and then the flexibility of the core muscles (3).

Though exercise is considered to be a very important component of a LBP management there are a lot of contradictory claims in the past research. Very low to moderate references are only available for exercise therapy in terms of pain management and disability management among young adults (4). That was true in comparison with conventional management like the electrotherapy modalities and other exercise modalities.

Lack of endurance of LBP muscles have always been a concern, which results in pain after the patient has

assumed erect posture. Trunk endurance training have always produced better results in LBP subjects by reducing pain & improving function as early as 3 weeks of intervention (5). In spite of the proven effects of the endurance exercises there had been debate for its efficacy alongside other exercise modalities. The results have differed based on target population and in different chronicity of the ailment (6).

The next mostly researched exercise protocol is stabilization training (ST) or Lumbar stabilization exercises. ST was considered to be very effective, yet there are many contradicting studies results available in the past. There are claims that the general exercise program reduced pain disability associated with LBP much better and earlier compared to stabilization exercise (6).

As the immense complexity of back muscles and the mechanism by which they protect the vertebra and adjacent structure offers resistance to identify one exercise as most effective long-standing. There are various inconclusive arguments and comparisons drawn in the past which debated about the most effective intervention for managing LBP (7). Adding to the above issue, the complexity of pain processing and physiology and diversity in pain perception adds lot of subjectivity in the prognosis (8).

Conservative management using modalities and exercises mainly aims at accelerating the healing process and it is found to be effective in the treatment

for LBP. But endurance of the spinal muscles is also likely to be responsible for the symptom of LBP. Studies have been done to assess the effectiveness of endurance training for chronic LBP. Reviewing the previous studies, it has shown that there are studies done with conventional spinal exercise in case of acute and chronic LBP while not many studies have been found to compare the conventional spinal exercise with trunk extensor endurance training for subjects with sub-acute LBP (9). The purpose of this study is to determine the effect of trunk extensor muscle endurance training with conventional spinal exercise for trunk extensor muscle in subjects with LBP.

MATERIALS AND METHODS

This Quasi-Experimental Study Sample was performed with 56 patients of both male and female, of 25-35 years of age from Hospitals and Physiotherapy OP Department of Saveetha College of Physiotherapy. A consecutive sampling method was employed for selecting samples and a random table method was used to allocate subjects to two groups namely group A and group B. Subjects were selected if they had history of low back pain for a period of 6-12 weeks of duration. Subjects who were not able to complete the 60 seconds spinal extension endurance test (Biering-Sorenson test) (10) were only selected, which meant that they had a compromised spinal endurance. The Patients were excluded from the study if they were receiving any other treatment, or having any severe complications such as tumour, surgical conditions, receiving Pain killers and non-steroidal anti-inflammatory drugs.

Outcome measures used for the study were McGill Pain Questionnaire, Roland Morris Disability Questionnaire, 60 sec spinal extension endurance tests (11-13). Written informed consent was received from all the 56 patients with the history and examination results included in this study. Pre-test values of outcome measure were obtained before subjects were divided into two groups. Using a convenient sampling technique, 28 participants were assigned to the experimental group and 28 participants to the control group.

Subjects in the experimental group received trunk extensor muscle endurance training. In endurance spinal extension exercise the patient had to be in prone position on the floor/couch. Control Group subjects receive spinal extension exercise, the patient lies on

the floor/couch in prone and in suspension position, the exercise consisted of protocol as, prone with single arm/leg lift, prone with alternate arm and left lift, prone on hands - quadruped position and extend one leg/arm, bridging exercise, single leg bridging.

The exercises were performed 3 times per week, for 6 weeks for duration of 30-45 minutes. Each exercise consists of 3 sets and 10 repetitions with a holding time of 10 seconds. After the intervention was completed a reassessment session was performed, where the subjects completed the McGill pain questionnaire and RMDQ and 60 sec endurance tests.

Statistical analysis

Age and gender were the independent variables and the performance on the 60 seconds endurance test, Roland Morris Disability Questionnaire, McGill Pain Questionnaire were the dependent variables for this study. The between group analysis was done using an independent sample test and Mann-Whitney U test for parametric data and non-parametric data respectively. One-way repeated measures ANOVA was used for the within-group analysis for the parametric value and Freedman's test for the non-parametric value. Post Hoc analysis was done using Dunn's test.

RESULTS

All the 56 subjects accounted for the study results as there were no dropouts. There was homogeneity in the baseline evaluation of the demographic data of the subjects in both the groups as the groups were similar at the time of recruitment. A chi square evaluation was performed which revealed that there is no significant difference between the two groups in terms of sex distribution, age distribution and ailment duration with a chi square value of 0.0479 and a p-value of 0.826. The between group analysis of the pre-test values of McGill pain questionnaire show that there is no significant differences with the P value of 0.147 and a t value of 1.491. Similar results were shown in the other two outcome measures also. In a 60 second trunk extension endurance test there was no significant difference with the P value of 0.282 and a t value of 1.096 and the Roland Morris disability questionnaire showed p value of 0.736 and t value of 1.399. The between group analysis of pre and post-test values for both the groups show that there is a significant difference between experimental group and control group which are shown in Table 1, 2, and 3.

Table 1: Comparison of Mc Gill pain questionnaire in pretest, mid test and post test

Mc Gill	Experimental Group (Mean±SD)	Control Group (Mean±SD)	t- value	P value
Pre-Test	28.27±3.555	30.07±3.035	1.491	0.147
Mid Test	12.93±3.453	24.87±3.357	9.957	0.000
Post Test	2.13±1.642	8.53±4.596	5.079	0.000

Table 2: Comparison of 60 seconds trunk extension endurance test in pretest, mid test and post-test

60 Seconds Endurance	Experimental Group (Mean±SD)	Control Group (Mean±SD)	t- value	P value
Pre-Test	5.00 ± 1.558	4.47 ± 1.060	1.096	0.282
Mid Test	10.13 ± 2.200	7.93 ± 1.668	3.087	0.005
Post Test	16.20 ± 1.699	12.47 ± 2.031	3.087	0.000

Table 3: Comparison of Roland Morris disability questionnaire in pretest, mid test and post-test

RMDQ	Experimental Group (Mean±SD)	Control Group (Mean±SD)	t- value	P value
Pre-Test	14.47 ± 1.685	15.27 ± 1.438	1.399	1.73
Mid Test	8.07 ± 2.658	11.60 ± 1.805	4.259	0.000
Post Test	0.80 ± 0.941	4.33 ± 2.440	5.233	0.000

The within group analysis of group A showed that there is a significant difference in the McGill pain questionnaire, 60 seconds trunk extension endurance test, Roland Morris disability questionnaire with F value of 4.236, 3.879, 3.987 and p value of 0.021, 0.018, 0.011 respectively. The post HOC analysis showed that there was a significant difference between the pre-test and the post-test value but there was no significant difference between the pre-test and pre-test value. The same pattern was shown in the other two outcome measures also. The within group analysis of the control group showed that there was a significant difference between the test results in the McGill pain questionnaire, 60 seconds trunk extension endurance test, Roland Morris disability questionnaire with F value of 3.236, 3.669, 3.599 and p value of 0.032, 0.029, 0.030 respectively.

DISCUSSION

This study shows that trunk extensors endurance training reduced pain in the short term in subjects with sub-acute LBP. These results are supported by previous results where endurance training helps in reduction of pain and improves functional ability (14-18). Yet it is being debated for its efficacy compared to other interventions like strength training among various populations (15). This study supported by Chock *et al.*, states that the pain may be caused by tissue damage in an exercise or activities that train the trunk muscles will be beneficial and helps to relieve pain (16).

Rohini *et al.*, did a comparison of effects of specific stabilization exercise and conventional back extension exercise for low back pain patients and he states that conventional exercises will enhance trunk performance. In case of low back pain those muscles will be inhibited reflexively and there will be insufficient stabilization to the spine. Therefore, improving the trunk strength by training such muscle is effective (19).

Even though both endurance exercise and conventional spinal exercise has proven benefit in treatment of subacute low back pain, the endurance

exercise has some beneficial physiological effects for faster recovery by means of exercise improving oxygen capacity, metabolic capacity, increase mitochondrial size and number, enzymatic activities which allows the muscle to use oxygen delivery, increase local glycogen storage and this alteration allows more exercise before fatigue, which is stated by Hall and Brody (20). Thus, the Purpose of including the mid test at the third week is to find out the recovery rate in both the experimental group A and conventional group B. Thus, from the statistical analysis values shows that the experimental groups A shows significantly faster improvement in the mid test as compared with the conventional group B. There are few limitations of the study like small sample size, age group selection was minimal and inadequate Follow up which needs to be focused in future research to strengthen the current results.

CONCLUSION

Although both endurance training and conventional spinal extension have been proven to be effective methods in reducing pain and improving endurance and functional status, endurance training has proved to be a much more effective method and provide faster recovery than conventional spinal extension exercise in treatment of patients with subacute low back pain.

CONFLICT OF INTEREST

The authors have no conflicts of interest.

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