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Effect of Endurance Training Of Trunk Extensor Muscles on Pain and Endurance in Patients with Sub Acute Nonspecific Low Backache

Bala, K., Gakhar, M. and Jagga V.
Prem Physiotherapy and Rehabilitation College Panipat, Haryana, India

Abstract

Objective: the study aimed to find out the effect of endurance exercises on trunk extensor muscles endurance and pain. Methods: Total 38 subjects of both genders ranging in age between 18 to 40 years suffering from subacute non specific low back pain were taken and equally divided into two groups, group A(control group) and group B (experimental group).The values of VAS and modified Biering Sorensen test were taken from each subject prior to the intervention. Then subjects of both groups received hot pack for 15 minutes and then group A received general mobility exercises including stretching and strengthening exercises of lumbar spine, and group B received 5 levels of endurance exercises for 5 times a week for consclutively 3 weeks. The values of VAS and modified Biering Sorensen test were again measured on 8^{th}, 15^{th} and 22^{nd} day. Results: Comparison of baseline values of both groups showed a highly significant improvement in pain and endurance. Conclusion: Both trunk extensors endurance training and general mobility stretching strengthening exercises are equally effective in reducing pain and increasing endurance in patients with non-specific subacute low back pain.

Key words: Endurance, low back ache, Biering Sorensen test, trunk extensors

Introduction

Low back pain can be defined as any form of pain, muscle tension, or stiffness localized between the costal margins and the inferior gluteal folds, with or without radiation into the lower limbs. For the majority of cases however, no medical cause can be found for their back complaints and therefore no definitive diagnosis can be given labeled as "nonspecific" low back pain. The symptoms of nonspecific low back pain may be related to mechanical strain (e.g., manual material handlings, sports activities) and/or psychosocial stressors (e.g., complex cognitive demands, job dissatisfaction), but they can also develop spontaneously. *(Vanrhijn, et al, 2009)* Some authorities report that poor endurance of trunk extensor muscles may induce strain on passive structures of lumbar spine, leading eventually to low back pain. Evidence suggests that muscle endurance is low for people with low back pain than individuals without low back pain *(Hultman et al, 1993).* Fatigue can affect the ability of people with low back pain to respond to the demands of an unexpected load. Fatigue after repetitive loading also leads to a loss of control and precision, which may predispose an individual to developing low back pain. *(Parnianpour et al, 1988).* Therefore, trunk muscle endurance training has been recommended to elevate fatigue threshold and improve performance, thus reducing disability. The results of the study may help the physiotherapists to understand the muscular cause provoking the pain

and treat it suitably with the endurance exercises or general mobility exercises.

The purpose of this study was to find out whether endurance and pain due to nonspecific sub acute low back pain are improved by the endurance training of trunk extensors.

Materials & Methods

The consent of the hospital administration and patient with prior permission was taken before starting the study. 38 subjects having symptoms of nonspecific low back ache of duration 6 weeks to 3 months, both genders ranging in age between 18-40 years were included in the study. They were randomly divided into group A (Control group) and group B (Experimental group) with 19 subjects in each group.

The subjects were excluded on the basis of having any history of spinal or lower limb surgery, prediagnosed case of spinal or pelvic fracture, pregnancy, prediagnosed case of general conditions like uncontrolled hypertension, previous myocardial infarction, respiratory disorders etc., specific low backache i.e. backache due to any nerve root compression (the radicular syndrome), trauma, infection or presence of a tumor, intervertibral disc prolapse patients having signs and symptoms of instability i.e. spondylolysis, spondylolisthesis corresponding to a symptomatic spinal level: catchimg, locking, giving way or a feeling of instability, patients having any history of congenital abnormalities ankylosing spondylitis.

All subjects initial measurement of back extensors endurance by Sorensen test, pain at rest by Visual Analogue Scale were taken on day 1 (entry level).

Group A (Control group): Subjects in the control group were given a hot pack for 15 minutes in prone lying position and general mobility exercises including stretching and strengthening exercises of lumbar spine. These subjects were asked to perform the exercises eight times. The exercise regimen therefore, was completed in 30 to 45 minutes. These exercises were performed five days a week for three weeks in the physiotherapy department.

Experimental group: First hot pack for 15 minutes was applied to the subjects. Then they were asked to perform exercise protocol five times a week for three weeks in the physiotherapy department. Exercise protocol was adapted from study by *Moffroid et al (1993)*. The exercise protocol had 5 levels;

Level 1 Bilateral shoulder lifts in prone position.

Level 2 Bilateral shoulder lifts with hands behind the head in prone position

Level 3 Bilateral shoulder lifts with both arms elevated in prone position

Level 4 Contra lateral arm and leg lift in prone position

Level 5 both the arms and leg lifts in prone position.

All the subjects started the protocol from level 1 (i.e. first test position). As soon as the subjects could hold a given position for 10 seconds and performs 25 repetitions with 3 second rest inbetween efforts. After that, they progressed to the next level. If pain was aggravated during the exercise, the subjects were asked to stop the protocol. If the pain diminished within 5 minutes after the exercise, they were asked to continue the exercise and to hold the exercise position for 5 seconds. They were progressed to 10 seconds if there was no adverse response. After 10

repetitions, the subjects were instructed to rest for 30 seconds to 1 minute. The rest interval was 1 minute for every 25 repetitions until 125 repetitions were completed.

Subjects who encountered difficulty within a particular level of exercise were asked to stop the exercise and perform the lower level exercise and then progress slowly. The aim was to encourage the subjects to exert moderate workload within pain tolerance, particularly on entry into the program. The exercise period varied from 30 to 45 minutes. Each subject received treatment protocol 5 days per week, (15 sessions). The scores were taken at the day of assessment, 8th day, 15th day and 22nd day.

Results

Results were analyzed using unpaired and paired t-test by using SPSS version 15. Comparison of baseline values of VAS for Group A gave a highly significant value of 0.001 and an overall improvement of 65.54 %, while Group B showed an overall improvement of 52.87 %.

The comparison of baseline values of endurance for group A gave a highly significant value of 0.001 and an overall improved of 62.27% while group B showed an overall improved of 52.29%.

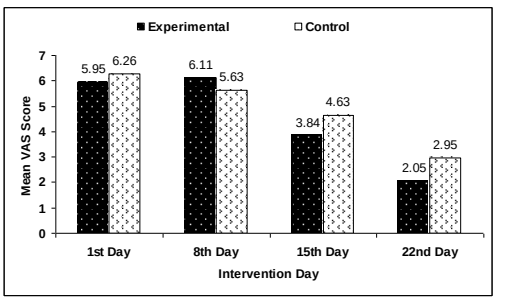

Figure 1: Comparison of mean values of VAS within experimental and the Control groups

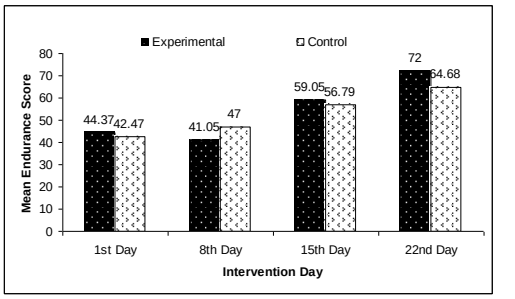

Figure 2: Comparison of mean values of Mean Endurance Score within experimental and the Control groups

Discussion

The results of this study reveals that endurance training of the trunk extensor muscles and general mobility spinal stretching and strengthening exercises both are equally effective in reducing pain and increasing endurance in subjects with nonspecific sub acute low back pain. The subjects in this study had similar baseline values of all dependent variables suggesting that both groups had homogenous distribution of patients. The participants in this study were moderately disabled by back pain that had lasted between six weeks to three months. Most of participants were females as back pain is most common among females as reported by *Stranjalis et al (2004)*. After trunk extensors endurance training and general mobility spinal stretching and strengthening exercises it was found that there was significant improvement in pain in both the groups. The reduction in pain may be due to the gain in endurance and strength of back extensor muscles following training as it has been suggested that poor endurance of trunk muscles may induce strain on the passive structures of lumbar spine, leading to low back pain. The results of the study differ from those studies in which no improvements were found following exercise intervention. The exercise

program in these studies consisted of flexion and extension mobility exercises. This exercise program was different from the program of exercises used in this study. Lindström et.al and Indahl et.al found some positive effects of their exercise programs on pain and function. In these studies, exercises or activities that trained the trunk muscles were encouraged. *Staal et al (2003)* and *Koumantakis et al (2005)* also found significant reduction in low back pain severity following general mobility exercises. The results are also supported by the study done by Petersen et.al in which reduction in pain was found following strengthening exercises in patients with nonspecific low back pain. Thus, both muscle rehabilitation and simple mobilization exercises are helpful in improving function at the sub acute stage of nonspecific low back pain.

During endurance training the pain of patients is increased at 8^{th} day of treatment. This finding is different from other studies where they have taken reassessment only after 3 weeks of treatment and not after the 8^{th}, 15th, 22nd day of treatment as done in this study. The increase in pain however could be due to the acute muscle soreness which often develops during or after strenuous exercise performed to the point of muscle exhaustion.

Following the trunk extensors endurance training and general mobility exercises it was also found that there was significant improvement in endurance in patient of both group i.e. in group A and in group B after three weeks of treatment. The experimental group and the control group made comparable progress on test performance regardless of exercise. The exercise program required subjects to exercise five times a week for three weeks. This finding differs from those in previous studies done by *Chok et al (1999)* in which muscle endurance does not improved following trunk extensors endurance training. The exercise program required subjects to exercise three times a week for six weeks in Beverly *Chok et al (1999)* study. The results could be due to differences in exercise dosage and patient profile. The results of this study are similar with the findings of *Moffroid et al (1993),* and *Kahanovitz et al (1987)* which suggests that endurance training was effective for increasing isometric endurance of trunk extensors in subjects without low back pain. The results of this study are also related to the study done by *Clarke (2009)* in which trunk extensors endurance training yield better improvement in trunk extensors endurance in acute low back pain hockey players.The increase in endurance in both groups may be because of increased oxidative and metabolic capacities which allow better delivery and use of oxygen. Thus, the sub maximal exertion demanded by the exercise program in our study on subjects with sub acute low back pain was able to demonstrate an effect on the muscle endurance as measured by the Sorensen test.

Conclusion

This study compared the efficacy of trunk extensors endurance training and general exercise to decrease pain, improve endurance and to decrease functional disability in patients of nonspecific sub acute low back pain and it is concluded that both trunk extensors endurance training and general mobility stretching and strengthening exercises are equally effective in reducing pain, increasing

endurance and decreasing disability in patients with nonspecific sub acute low back pain.

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