

Occupational therapy management of non-specific low back pain: A randomized controlled trial

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Abstract

Non-specific low back pain is a common condition seen in clinical practice. But there is no conclusive evidence on management of this condition. For 10 - 40% of individuals with LBP, the pain becomes chronic and a significant burden on the health care systems. Unfortunately, 85% of LBP cases become classified as non-specific meaning that a definitive diagnosis cannot be found. This study evaluated Movement control exercise with the general exercise. Treatment outcomes were measured at baseline, post-treatment. 60 patients were equally divided into two groups. They were evaluated on pain, disability, isometric extensor strength, extensor endurance, cross sectional area of TrA muscle and flexibility.

Conclusion: Upon Comparing the groups, it was determined that the improvement in experimental i.e. motor control exercise group were more significant than control group ($p < 0.05$). The nonspecific low back pain has a very important component of motor control deficit. The improvement seen in experimental group is also clinically meaningful and hence can be used for non-specific low back patients.

Keywords: NSLBP, flexibility, TrA cross sectional area, Sorenson test, Strain gauge dynamometer, VAS scale, Motor control exercises.

Introduction

Low back pain, although sometimes due to other causes, can result from alterations from normal biomechanics in the vertebral column and constitutes a major health problem. For 10 - 40% of individuals with LBP, the pain becomes chronic and a significant burden on the health care systems. Unfortunately, 85% of LBP cases become classified as non-specific meaning that a definitive diagnosis cannot be found.⁽¹⁾

A recent update of the clinical guidelines for the management of non-specific low back pain (NSLBP) including national and international guidelines from 15 countries can provide only limited recommendations.^(2,3) Back pain is defined as chronic when the pain remains for longer than three months (Wells et al., 2013). NSLBP can have a debilitating effect on patients' lives, resulting in disability and reducing their ability to carry out activities of daily living. Acute back pain is pain that remains for less than 6 weeks, sub-acute back pain is back pain for between 6 weeks and 3 months. Forty percent of patients with acute low back pain are at an elevated risk of developing CLBP.⁽⁴⁾

Core stabilization program has been shown to significantly reduce LBP by 39%–76.8%, and a muscular strength program significantly reduced LBP by 61.6%.^(5,6) Stretching the soft tissues in the back, legs and buttock such as the hamstrings, erector muscles of the spine and hip flexor muscles, ligaments and tendons can help to mobilize the spine, and an increase in the range of motion of the spine can assist back pain.⁽⁷⁾

The literature review suggested that nonspecific low back pain response to exercises is inconclusive. There is inconclusive evidence regarding exercise

therapy effect on the non - specific low back pain. At present, the influence of exercise intensity, frequency of therapy sessions, and program duration on outcome remains largely unknown.

The mechanisms of action by which exercise therapy appears to be an effective treatment for NSLBP are presently unclear. There is little relationship between changes in clinical symptoms and changes in any "objectively measured" aspect of functional capacity (e.g. strength, flexibility, muscular endurance, cross section of transversus abdominis etc.) This may explain the conclusion that there is no convincing evidence to endorse the use of one type of exercise over another in the treatment of NSLBP.

Methodology and Techniques

Study Design: This study was randomized controlled trial. In this randomized controlled trial patients with non-acute NSLBP were included. Patients were recruited and treated in hospital outpatient department. Movement control exercise were compared to general exercise. Treatment outcomes were measured at baseline, post-treatment. The study was designed as test retest design (randomized controlled trial).

Study Sample: The study was carried out at Santosh Occupational Therapy College, Delhi, NCR and was approved by the institutional ethics committee prior to the commencement of the study. Subjects were chosen from the hospital outpatient department by convenient sampling for the study.

Inclusion Criteria

1. Age 18 to 35 years.
2. Non-acute LBP (> 6 weeks' duration of symptoms) and less than 3 months of sick leave due to LBP.
3. Two or more positive tests for impaired movement

- control.
- Clinical behaviour: posture and movement aggravate and ease symptoms; symptoms are relieved by reducing the strain on the lumbar region.
 - Written informed consent.

Exclusion Criteria

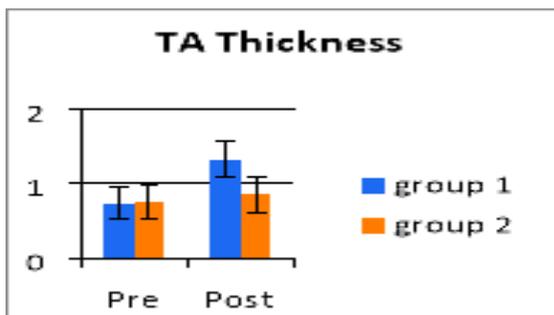
- Specific LBP (Fractures, carcinoma, anomalies, nerve root affection with neurological signs e.g. sensitivity or reflex loss, muscle weakness, radicular pain below the knee).
- VAS level >8 /10.
- Less than 6 weeks' post-surgery following all surgery on the lower back.
- Post-surgery with spondylodesis.
- High level of psychosocial risk factors (>130 points on the ÖMPQ).

The subjects were evaluated for pain using VAS scale, flexibility using sit and reach test, disability using Oswestry low back pain disability questionnaire, isometric back strength by strain gauge dynamometer, endurance strength measurement by beiring sorensen test and transversus abdominis cross sectional area by real time ultrasound.

Data Analysis: Statistical analysis was carried out using SPSS version 21 for Microsoft windows. Mean and standard deviation for age and BMI was calculated for all the subjects. Frequency was calculated for the gender for all the subjects. A Kolmogorov-Smirnov test was conducted which indicated that the data were normally distributed hence parametric testing was done. Systematic error (the mean of differences of scores of the test and retest) was calculated by paired t-test with a significance level of 0.05

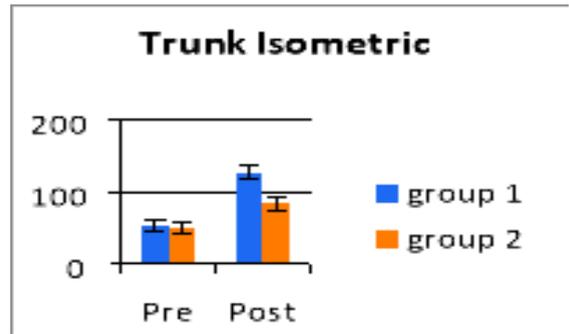
Result

TA Thickness: Shapro-wilk test revealed that there is non-significant difference in the normal distribution of TA thickness for group 1 in pre-treatment values (p=0.069) and post treatment values (p=0.160) as well as for group 2 in pre-treatment values (p=0.091) and post treatment values (p=0.073).

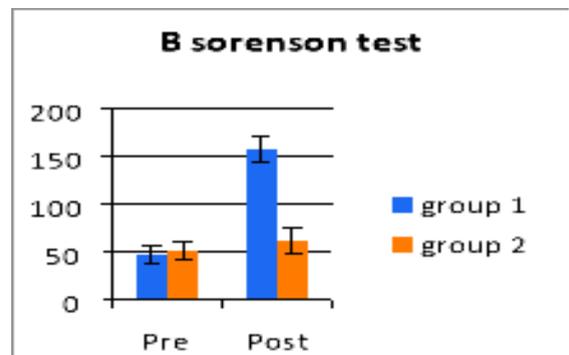


Trunk Isometric Strength: Shapro-wilk test revealed that there is non-significant difference in the normal distribution of Trunk isometric strength for group 1 in pre-treatment values (p=0.253) and post treatment

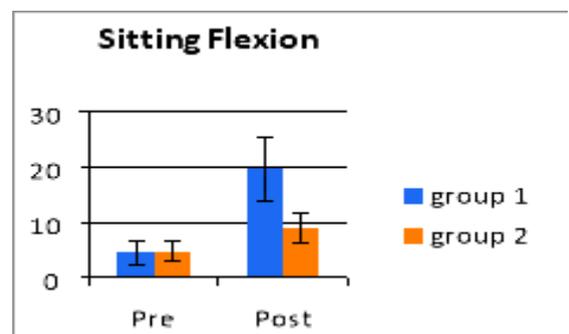
values (p=0.122) as well as for group 2 in pre-treatment values (p=0.110) and post treatment values (p=0.051).



Sorensen Test: Shapro-wilk test revealed that there is non-significant difference in the normal distribution of Sorensen test for group 1 in pre-treatment values (p=0.695) and post treatment values (p=0.158) as well as for group 2 in pre-treatment values (p=0.068) and post treatment values (p=0.051).



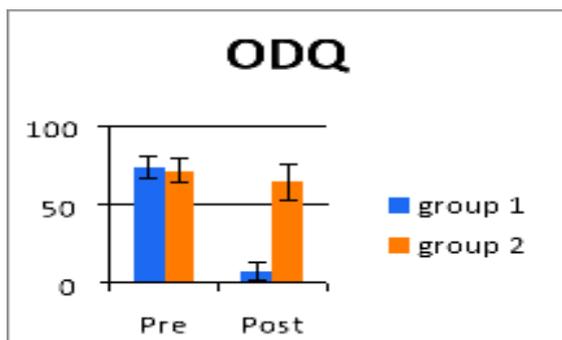
Sitting Flexion Test: Shapro-wilk test revealed that there is non-significant difference in the normal distribution of Sitting flexion test for group 1 in pre-treatment values (p=0.100) and post treatment values (p=0.064) as well as for group 2 in pre-treatment values (p=0.080) and post treatment values (p=0.077).



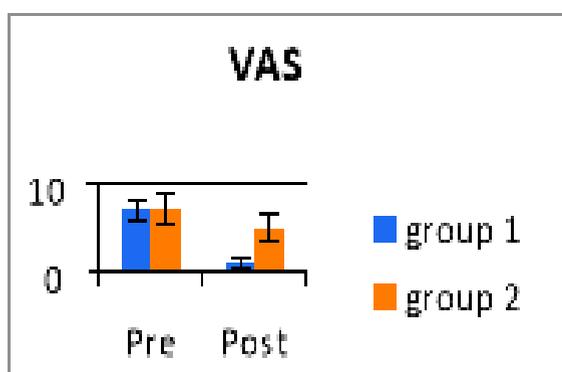
Oswestry Pain Disability Questionnaire (ODQ): Shapro-wilk test revealed that there is not a normal distribution of ODQ for group 1 in pre-treatment values (p=0.001) and post treatment values (p= <0.001) as well as for group 2 in pre-treatment values (p=

<0.001) and post treatment values (p=0.001). non-parametric test was used to conduct analysis. Wilcoxon signed ranked test for group 1 gives a z value of 4.786 and p value of <0.001 and group 2 gives z value of 4.037 and p value of <0.001.

Mann Whitney test for between group measures gives a value of z value as 2.104 and 6.674 and p value of 0.035 and <0.001 for group 1 and 2 respectively.



VAS Measures: Shapro-wilk test revealed that there is not a normal distribution of VAS for group 1 in pre-treatment values (p=0.024) and post treatment values (p= <0.001) as well as for group 2 in pre- treatment values (p= 0.069) and post treatment values (p=0.123). non-parametric test was used to conduct analysis. Wilcoxon signed ranked test for group 1 gives a z value of 4.836 and p value of <0.001 and group 2 gives z value of 4.581 and p value of <0.001. Mann Whitney test for between group measures gives a value of z value as 5.75 and 6.570 and p value of 0.566 and <0.001 for group 1 and 2 respectively.



Discussion

Occupational therapy exercises have a vital role in management of non-specific chronic low back pain. Exercise therapy which includes strengthening program, flexibility, etc. have a positive role in treatment of low back pain. It is recommended for patients with Nonspecific low back pain (NSLBP) to remain physically active, as long periods of inactivity adversely affect recovery potential. A variety of different types of exercise have been explored to treat Nonspecific low back pain (NSLBP) including low-to-

moderate intensity aerobic exercise, high intensity aerobic exercise, core stabilization (TrA muscle) and muscular strength exercises and flexibility programs.⁽¹⁾

The core stabilization and strengthening protocol involving the experimental group and control group was found to increase the low back strength by 127.90% and 231.35% as tested by Sorenson test and strain gauge dynamometer respectively. The percentage change in the two groups was significant and stands at 85% reduction in pain for the experimental group. The percentage increase in the study was found to be highly significant. Similar findings were also concluded by other studies which said that muscular strength program significantly reduced nonspecific low back pain (NSLBP) by 61.6%.⁽⁸⁾

This study also evaluated the disability index by using Oswestry disability questionnaire (ODQ) and measuring it in both the experimental and control groups. The result for experimental and control group were reduction in disability by 89.19% and 10% respectively. The results of other study are also in line with this study.

In addition, an increase in the tensile behaviour of the muscle tissue helps to counter excess load placed on spinal column and decreases low back pain. The study reported that the experimental group significantly reduced NSLBP by 32.5% (according to the VAS), 23.2% (Pain Disability Index) and 21.5% (Pain Rating Scale). The control group significantly reduced CLBP by 16.8% (VAS), 12.4% (Pain Disability Index) and 8% (Pain Rating Scale).

Stretching the soft tissues in the back, legs and buttock such as the hamstrings, erector muscles of the spine and hip flexor muscles, ligaments and tendons can help to mobilize the spine, and an increase in the range of motion of the spine can assist back pain.⁽⁸⁾ This is because stretching increases extensibility of the connective tissue in the back, which can lead to improved range of movement.

This study measured the spinal flexibility by means of sitting flexion test/forward reach test. The result of the study shows that there is 344% increase in flexibility in experimental group in comparison to 88% for control group. The results of the study are in line with that of other studies.

Hamstring muscle shortening reduces the hip flexion range of motion due to being attached to the ischial tuberosity of pubic bone, which has an effect on a lumbopelvic rhythm during forward bending and can cause lumbar stress.⁽⁸⁾ Flexibility exercises are often used in exercise rehabilitation programs as they have been shown to be effective at reducing the pain associated with CLBP.

Pain may have several clinical manifestations and can be associated to different symptoms. Some authors have suggested that therapists manage pain or other syndromes as per their source i.e. peripheral, central and / or associated mechanisms, identified during

evaluation.⁽⁹⁾ Understanding and identifying such mechanisms help evaluation judgment and clinical reasoning, treatment and prognosis of patients with pain. The percentage change in the two groups is also significant and stands at 85% reduction in pain for the experimental group in comparison to 30.29% for the control group.

Reduction of pain is a net result due to activation of following below mentioned peripheral, central and associated systems. This study used a reliable and valid measure of quantifying and providing evidence that exercises in nonspecific low back pain have an effect on core muscles cross section area. The function of the TrA is to stabilize the pelvis and low back prior to movement of the body. The mechanism is the feedforward bilateral muscle activation resulting from spinal perturbations/instability with activities.

Occupational therapy management primarily restores motor control of this vital stabilizer muscle. Current trends indicate it as effective means of treating low back pain with trunk stabilization and to enhance motor control.⁽¹⁰⁾

It has been shown that the TrA is activated after the deltoid (~50ms) with arm movement task studies with LBP patients. A recent study showed that during a voluntary activity of the TrA, induced pain was shown to decrease the activation of TrA. Pain will alter a muscle's role as movement controller for protection through the pain adaptation model. Many prior studies have shown reduced TrA muscle thickness with chronic LBP. Along with this there is, delay of TrA activation timing and optimal muscle firing is altered.⁽¹¹⁾

This study measured TrA cross-section by real time ultrasound and found 78.28% increase in experimental group in comparison to 15.15% to that of control group.

The results of this study draw similarity with that of other studies which state that stabilization exercises are more effective than McKenzie exercises in improving the intensity of pain and function score and in increasing the thickness of the transverse abdominis muscle.⁽¹²⁾ The assessment of CSA can therefore be used as a measure of treatment improvement or progression in patients with NSLBP.

Limitations of the Study

1. Patients were recruited from single clinical settings i.e. Santosh College of Occupational Therapy, Delhi, NCR. Hence generalizability of the results may not be entirely true.
2. Cross sectional area of other core muscle i.e. multifidus could also have been taken.
3. Motor control exercises in experimental group could also have incorporated PNF techniques for activation of core musculature.
4. EMG (electromyography) could have been used to determine post activation potential of the muscles.
5. Biofeedback could have used for accurate motor control exercises in the groups.

Conclusion

Evidence-based healthcare has received increased

attention during the last decade and is important to monitor and improve quality of care. Guidelines are useful tools in this process aiming at changing behaviour of healthcare professionals, if needed. Low back pain is a good example of a field where evidence has been provided by many randomized trials and summarized in many systematic reviews. However, any conclusive end had not been reached. This study included patients with impaired motor control which has been proven to be important component of nonspecific low back pain. The study concluded that experimental group receiving specific exercise program has clinically superior outcomes when measured on parameters of low back muscle strength, flexibility, pain, disability, and TrA cross section area.

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