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# Dynamic Sitting Exercise versus Spinal Extension Exercise on Pain, Lumbar Mobility and Quality of Life in Adults with Mechanical Low Back Pain

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## Abstract

**Background:** Now-a-days it is seen that busy work schedule and unhealthy environment leads to discontinuity in exercising despite of awareness and knowledge of its effectiveness on problems like low back pain. There are many factors including improper posture, over loading, immobility, trunk muscles weakness leads to mechanical low back pain in adults. Exercises of various types have been used in managing low back pain. Hence there is a need to find out a single functional and effective exercise for such problems so that they can be done anytime during work and without any equipment which is also economical.

**Methodology:** Thirty adults aged between 20-30 years participated in this comparative experimental study. After underwent physical screening for selection criteria mechanical low back pain followed by simple randomization participants were divided into group A and group B. Group A and group B received dynamic sitting and spinal extension exercise respectively for thrice a week for six weeks. Pre and post values were assessed using outcome measures Visual Analog Scale for pain, MMST used for lumbar mobility and Short Form-36 Health Survey Questionnaire for quality of life.

**Results:** In comparison of post test scores of outcome measures evidenced that the reduction of pain score, improvement in lumbar mobility and quality of life scores. There were significantly improvement among the adults with mechanical low back pain treated with Dynamic sitting exercise (DSE) than treated with Spinal extension exercise (SEE).

**Conclusion:** 6 weeks of dynamic sitting and spinal extension exercise can prevent in pain and improvement in lumbar mobility and quality of life in adults with mechanical low back pain.

***Key words****: Mechanical low back pain; dynamic sitting exercise; spinal extension exercise; lumbar mobility; quality of life.*

## Introduction

Low back pain (LBP) is defined as pain and discomfort that are localized below the costal margin and above the inferior gluteal folds with or without leg pain.(1)

It is a very common leading cause of disability worldwide among all age groups. Globally, disability caused by low back pain increased by 54% between 1990 and 2015, more common among people with low socioeconomic status. People with physically demanding jobs, physical and mental comorbidities, smokers and obese individuals are at greatest risk of low back pain with persistent and recurrence pain. So cost, health-care use and disability attributed to low back pain are going to increase in coming decades.(2) In India, LBP is experienced among 60% to 80% of adults. (3). Recurrent LBP is defined as a new episode of pain that occurs after a symptom-free period of 6 months and is not an exacerbation of chronic LBP. In general, acute low back pain resolves within weeks, but may recur in 24%- 50 % of cases within 1 year.(1,3) There are also other signs and symptoms which can be classify as non- mechanical and mechanical. Non-mechanical pain originates from inflammatory, non-organic and medical

conditions whereas mechanical pains are those that are consistently influenced by movements and postures.[5] Compared to standing posture prolonged sitting, decreases lumbar lordosis, increases low back muscle activity, disc pressure and pressure on the ischium which are associated with occupational LBP.[6] Evidence suggests that signs of perceived body discomfort experienced by many individuals particularly at the buttock and low back regions during prolonged sitting. Discomfort during prolonged sitting has been leads to increased muscle fatigue, decreased intervertebral disc space, nutrition and reduced oxygen and blood flow in muscles. Prolonged sitting in the forward leaning posture significantly increased discomfort in low back compared with other sitting postures.[7] In present days there are many treatment approaches are available to manage low back pain such as electrotherapy, manual therapy, exercise therapy and ergonomic modifications. Habitual improper posture with low muscle activity in daily life affects both lumbar muscle volume and strength. So exercise programs are effective at decreasing pain, improving physical function and increasing oxygenation and blood flow to the lower back of individuals. It is known that prolonged inactivity leads to decrease muscle strength, spinal flexibility and quality of life. In functional activities the back extensors are essential to bend, twist to move the upper body. To improve back extensors one of the treatment i.e. an Extension Oriented Treatment Approach (EOTA). This approach involves

combination of repeated active or passive extension movements to improve extension in the lumbar spine with the subject positioned prone.[8] DR. Jerome Fryer started using a form of seated decompression using arms with sitting position. Dynamic sitting exercise was modified from the Chair-care decompression exercises. This exercise improves muscle activation frequency with a proper posture during sitting which can prevent a decrease in low back mobility. Dynamic sitting exercise uses the arms to lift the body weight temporarily off the lumbar discs while remaining seated, with a combination of lower back extension and abdominal drawing -in-exercises. While sitting the act of lifting resets the position of the spine that encourages the subject to sit more upright after this exercise.[9]

## Methodology

Thirty adults were participated from Physiotherapy out-patient department in south Bangalore. After obtaining the ethical clearance from the ethical board of committee and informed consent from all the participants followed by the purpose of the comparative experimental study was explained in details including its benefits and risks; subjects were underwent physical screening according to the selection criteria.

The inclusion criteria of the screening examination were both male and female aged between 20 to 30 years (both male and female in 7:8 ratio) with mechanical low back pain and the exclusion criteria were acute low back pain, low back pain involving any disc pathology, a history of back, abdominal, hip joint and lower limb surgeries in the past 6 months, current pregnancy, congenital deformity of the spine, congenital deformity of limbs, musculoskeletal problems including tuberculosis, scoliosis, ankylosing-spondylitis, rheumatoid arthritis.

After the screening examination thirty subjects meeting the selection criteria were randomly assigned to two groups with each group fifteen sample followed by baseline assessment.

Group (A) Dynamic sitting exercise and group (B) Spinal extension exercise respectively.

Each group with 15 subjects was given 30 minutes exercise session 3 days per week. Both the groups A and B had performed exercises with 6 repetitions per minute with 5 second hold in a 30 minute session and a total of 3 sets of 6 repetitions each with 4 minute rest in between the sets were completed. Outcome measures like pain by VAS, lumbar mobility by MMST and quality of life by SF-36 were recorded before and after the intervention and statistical analysis were done.

Procedure for group A: (DSE) the subject was made to sit upright with arms in back of the chair and pushing downward by remaining the seated unloading the spine. The lumbar spine should be gently extended until they could feel slight stretching in the lower back. Then gently draw-in-abdomen to return to the neutral position. The subjects were holding this position for 5 seconds with the above instruction.

**Figure-1 Dynamic sitting exercise in upright sitting position while unload the spine by arm** Procedure for group B: **(SEE) the subject was made to lie down on abdomen while the hands with palms down. Now the subject was asked to do press-up movement with straight arms and hold for 5 seconds and return to the neutral starting position.**

**Figure-2 Spinal extension exercise in prone on elbow position**

## Results

Compared with the baseline values, there was a reduction in pain intensity, increase in lumbar mobility and QOL for both the groups. Student's paired t-test was used to compare the pain intensity for both the groups, before and after the treatment program. Both the groups showed significant ($p<0.05$) reduction in pain intensity. On comparing the pain intensity between the groups using Mann- Whitney U- test, it showed that group A had maximum pain reduction (posttest mean, 3.53; SD, 1.06) where as it is group B, which showed pain reduction next to group A (posttest mean, 4.67; SD, 0.62)

Likewise paired t-test was used to compare lumbar mobility for both the groups, before and after the treatment program and both the groups showed significant ($p<0.05$) improvement in it. On comparing lumbar mobility between the groups using Whitney U-test, it showed that group A had maximum improvement in lumbar mobility (posttest mean,18.73; SD, 1.43) where as it is group B, which showed pain reduction next to group A (posttest mean, 17.93; SD, 1.41)

Similarly paired t-test was also used to compare QOL using SF-36 questionnaire for both the groups, before and after the treatment program and both the groups showed significant ($p<0.05$) improvement in it. On comparing Quality of life between the groups using Whitney U- test, it showed that A had maximum improvement in QOL (posttest mean, 76.70; SD, 7.85) where as it is group B, which showed improvement in QOL next to group A (posttest mean, 62.56; SD, 4.08)

**Table -1 Mean and SD of pre and post-test outcome measures of adults with mechanical low back pain in between groups.**

| Sl. No | Outcome measures | Pre test | | Post test | |
|---|---|---|---|---|---|
| | | Dynamic sitting exercise(DSE) | Spinal extension exercise(SEE) | Dynamic sitting exercise(DSE) | Spinal extension exercise(SEE) |
| | | Mean ±SD | Mean ±SD | Mean ±SD | Mean ±SD |
| 1 | Pain (VAS) | 5.33±1.04 | 5.47±0.89 | 3.53±1.06 | 4.67±0.62 |
| 2 | Lumbar mobility (MMST) | 05.43±1.60 | 06.27±1.52 | 06.97±1.43 | 06.73±1.41 |
| 3 | Quality of life (SF-36) | 51.00±5.90 | 51.76±5.65 | 76.70±7.85 | 62.56±4.08 |
| Between group comparison | | VAS: z=1.807, p>0.05, NS<br>MMST: z=0.696, p>0.05,NS<br>SF-36: z=0.249, P>0.05,NS | | VAS: z=3.81, p<0.05, S<br>MMST: z=1.986, p<0.05, S<br>SF-36: z=4.159, p<0.05,S | |

S- Significant ($p<0.05$); NS – not significant ($p>0.05$)

## Discussion

The obtained results of the study proved the fact that there is a reduction in pain intensity, improvement in lumbar mobility and quality of life in both the groups individually. From the available literature support and sources this is presumed that DSE has an effect to decompress the lumbar spine which in turn may unload the pressure over the mechanoreceptors in order to reduce the pain intensity. It may also be helpful in increasing the blood flow to the lumbar muscles and enhancing intervertebral disc oxygenation with nutrition.

In other hand isolated spinal extension exercise is believed to have an effect on conditioning of the lumbar muscles and impact on disc fluid content and its distribution to go back to its place.

However while comparing both the techniques the efficacy of the DSE was found to have a better result than SEE in this study and the reason behind this is believed that the decompress effect of the DSE may have an impact on unloading the disc without straining the lumbar muscles with activating the abdominal structures where as in case of SEE the lumbar muscles have to work for pushing the disc back into its place and it is known that these muscles are already influenced by being over used in such conditions.

## Conclusion

Supporting evidence from the literature along with the outcome of this study with significant statistical changes leads us to conclude by accepting the hypothesis. Hence it is stated that "there is significant reduction in pain, improvement in lumbar mobility and QOL in both the groups, whereas 6 weeks of dynamic sitting exercise group is found to be more effective than spinal extension exercise group in adults with mechanical low back pain.

**Conflict of Interest :** There is no affiliation

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**Ethical Clearance** certificate taken from The Oxford College of Physiotherapy, Bangalore.

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