Efficacy of Spinal Extension Exercise and Ergonomic Advice for Non-specific Low Back Pain Among University Population

Ahamed Latheef¹, Vinodhkumar Ramalingam², Pradeep Balakrishnan³, Shyamala Ganesan⁴

¹Undergraduate, ²Professor, Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India, ³Lecturer, School of Health Sciences, KPJ Healthcare University, Kota Seriemas, Nilai, Negeri Sembilan, Malaysia, ⁴Assistant Professor of Anatomy, American University of Antigua College of Medicine, Coolidge, Antigua and Barbuda.

How to cite this article: Ahamed Latheef, Vinodhkumar Ramalingam, Pradeep Balakrishnan et. al. Efficacy of Spinal Extension Exercise and Ergonomic Advice for Non-specific Low Back Pain Among University Population. Indian Journal of Physiotherapy and Occupational Therapy / Volume 18, Year 2024.

Abstract

Background: College students are required to sit for long periods of time in their classrooms. Prolonged sitting is defined as sitting for more than 2 hours continuously, students usually sit in classrooms on an average of 6 to 8 hours per day. Prolonged sitting has become a major risk factor causing low back pain especially among university students. The recurrence of LBP at old age also increases if the person is found to have LBP at an early stage.

Purpose: The objective of this research is to establish the gradual development from functional limitations in non-specific low back pain (NSLBP) among college students after spinal extension exercise and ergonomic advice.

Materials and Methods: Based on inclusion and exclusion criteria, the subjects were identified. They were provided with an explanation of the study. A group of 60 subjects were recruited for this research and divided into 3 groups, in which the first group was given spinal extension exercise (n=20), the second group (n=20) was given ergonomic advice and the third group (n=20) was given combination of both the interventions. The Roland-Morris Disability Questionnaire is a 24-item self-report tool for assessing function. The entire process was performed from November 2022 to April 2023.

Result: From statistical analysis, the group that received spinal extension exercise combined with ergonomic advice has better outcomes. (p=0.001)

Conclusion: The spinal extension exercise given along with ergonomic advice is effective in the treatment of NSLBP for university students.

Keywords: Non-specific low back pain, spinal extension exercise, ergonomic advice, university population, Roland-Morris Disability Questionnaire.

Introduction

Most people deal with low back pain at a certain point in their lives, which is a very common problem. In many parts of the world, low back is a very common cause for activity resistance. When the patho-anatomical etiology of the pain cannot be
identified, the phrase “non-specific low back pain” is used. However, NSLBP is not adequately localized and is produced by soft tissue. Additionally, Non-specific low back pain refers to pain that is unrelated to neurological conditions or degenerative diseases. From various studies we can see that approximately 60% and 80% of people have back discomfort. Only 5% among them may be identified as having nerve root pain; the remaining 80% have non-specific low-back pain.

The college students attend lectures and spend time in front of computers to look up resources. A student spends an average of 6-8 hours of their day by sitting in class. Long periods of sitting are one of the causes contributing to musculoskeletal discomfort particularly in university students who experience low back pain. The most often affected anatomical sites for people who sit for longer duration are the shoulders and lower back region among the other musculoskeletal disorders. Because of poor posture and movement, these areas were strongly correlated with personal factors and work ergonomics. Nonspecific low back pain leads to functional disability if not treated for a period of time. It is on the rise in the university population. The incidence of low back pain may be influenced by a few anatomical variables. Awkward posture for longer duration can decrease the strength of Paraspinal muscles. According to a thorough literature review; poor dynamic trunk extension ability is connected to persistent back-related occupational impairment and recurrent low back discomfort.

Physiotherapeutic interventions play a major role in managing and in prevention of low back pain. The main aim in the course of treatment of non-specific low back pain includes pain relief, increase in function, patient education, increase in range of movement, and prevention of further episodes. LBP is generally treated with application of modalities. A great number of therapists agreed that physical activity and back education programs are effective. In workplaces, when considerable forward reaching is required, workers with low back pain find it difficult to bend forward and handle goods. If heavy bending and reaching in the front are avoided, handling objects can frequently be done with minimum stress. By providing a proper fit between the workers and their occupations, ergonomics attempts to improve individual comfort, health and safety, productivity, and efficiency. The McKenzie Method is used to treat patients with low back pain. You can take effective steps to lessen your back pain, such as back exercises and stretching for lower back pain. A thorough literature evaluation revealed a connection between poor dynamic trunk extension ability and low back-related persistent occupational incapacity and recurrence of low back pain. However, there is little proof to back up the effect of workouts specifically designed for extensions on non-specific low back discomfort in university students.

Aim

To determine whether spinal extension exercise and ergonomic advice is effective for reducing disability and improving function in subjects with Non-specific low back pain in the University population.

Materials and Methods

It was an experimental study conducted on 60 subjects with Non-specific low back pain taken from a university. Convenient sampling with a random allocation method was used in the study. The entire process was performed from November 2022 to April 2023.

Inclusion criteria:
- Age: 18 – 25
- Male and female subjects.
- Prolonged sitting (>3 hours)
- Suffering from Non-specific low back pain.

Exclusion criteria:
- Pregnant women.
- Patients with referred pain to lower limbs.
- Patients with known pathology (osteoporosis, disk herniation, spinal stenosis, etc.)
- Medical Illness (kidney disease, tumor)
- Patients with chronic disease affecting the musculoskeletal system.
- Patients with fractures in the spine and pelvis.
Outcome Measure:

The Roland-Morris Disability Questionnaire (RMDQ), a 24-item self-report survey, is used to measure how well people with non-specific low back pain can function. The scores vary between 0 (no impairment) to 24 (severe impairment), with each question contributing one point. Both the pre- and post-test results were gathered.

Procedure

The present study invited the students of a university with Non-specific low back pain. A Google link was circulated to 320 students through Whatsapp from which 267 students gave permission for them to take part in the study. Only 63 participants met the inclusion criteria. SLR test was performed for both the lower limbs to rule out any nerve related pathologies from which 3 were excluded. Informed consent was obtained from all the participants before assessment and interventions. The included participants were randomly allocated to 3 groups; Group A (n=20) received spinal extension exercise, the subjects in Group B (n=20) received only ergonomic advice while the subjects in Group C (n=20) received spinal extension exercise and ergonomic advice. Roland-Morris Disability Questionnaire (RMDQ) was used to assess the disability of participants in the study. The pre-assessment was conducted before starting the interventions. The post assessment was conducted following two weeks of interventions for all the three groups.

Spinal extension exercise:

The participants were instructed to perform spinal extension exercises 3-4 times a week for two consecutive weeks. They were instructed to take a prone lying position initially, followed by prone on elbows, then prone press-ups and standing extension exercise. All the extension exercises were repeated for 10 repetitions in two sets.

- **Prone lying**: the subjects laid their face down for one to two minutes.
- **Prone lying on elbows**: subjects laid their face down with extension of trunk on elbow and held for 5 seconds.
- **Prone press-ups**: subjects laid their face down and extension of the trunk by elbow to extension of trunk with the hand (push up position)

- **Standing extension exercise**: The subjects come to standing position, they were instructed to extend their trunks and hold the position for five seconds with their hands behind their backs.

Ergonomic advice:

The participants were instructed to follow the below advice:

**While sitting in class:**

- Correct seat height adjustments that allow the thighs parallel to the floor.
- Avoid stooping while you sit.
- Positioning the monitor/book directly in front of the person.

**While driving/traveling:**

- Prevent increased curvature of the back.
- Place the pillow behind the back.
- Use the mirrors to avoid frequent turning.
- Take necessary breaks during a long drive.

**While lifting heavy objects:**

- Heavy objects must be carried in a squat position by bending the knees and not by stooping.
- If the object is big, call another person for help.

Data Analysis

![Fig-1: All groups Mean and SD](image-url)
Table-1: Result reports the One-way ANOVA between groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Non-specific LBP</th>
<th>Pre test</th>
<th>Post test</th>
<th>F</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Std. Deviation</td>
<td>Mean</td>
<td>Std. Deviation</td>
</tr>
<tr>
<td>Group A</td>
<td>20</td>
<td>13.5500</td>
<td>2.35025</td>
<td>9.9000</td>
<td>2.40394</td>
</tr>
<tr>
<td>Group B</td>
<td>20</td>
<td>12.7000</td>
<td>3.04527</td>
<td>11.0000</td>
<td>3.19539</td>
</tr>
<tr>
<td>Group C</td>
<td>20</td>
<td>12.9500</td>
<td>3.01706</td>
<td>7.4000</td>
<td>2.62378</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>13.0667</td>
<td>2.79750</td>
<td>9.4333</td>
<td>3.11022</td>
</tr>
</tbody>
</table>

Result

Three treatment groups, each with 20 participants, were formed from the total of 60 subjects. The subjects were between the age group 18-25 years old, out of which (58.3%) male students and (41.7%) female students.

The pre-test results and post-test results were obtained using Roland Morris Disability Questionnaire and checked for significance (Table 1). All the three groups showed positive effects post treatment with reduced mean and standard deviation. All the three groups were compared together using their mean and standard deviation (Fig 1).

A one-way ANOVA report (Table 1) showed statistically significant differences between the groups following the intervention with significance ($p$ - value 0.001). The post intervention outcome of Roland-Morris disability questionnaire of all the three groups with their mean and standard deviation are shown in Fig 1. Following significant differences between the groups the post-hoc analysis was performed. The post-hoc value shows that Group C is better with mean difference (2.50) with significance ($p$-value 0.018) when compared with Group A. The post-hoc of Group C is also better with mean difference (3.60) with significance ($p$ - value 0.001) when compared with Group B. This result shows that there is more improvement in the participants in Group C post intervention compared to Group A and Group B, henceforth depicting that spinal extension exercise combined with ergonomic advice is much more effective than the exercises given alone.

Discussion

The main aim of this study is to find the efficacy of spinal extension exercise and ergonomic advice in treating non-specific low back pain for the students of university population. The results of this study show that the functional impairment measured by the RMDQ has significantly reduced. A group that received spinal extension exercise combined with ergonomic advice demonstrated improved effectiveness in treating NSLBP in college students when comparing students that received spinal extension exercise only in one group and ergonomic advice in another group.

Kanchan Kumar Starker, et.al, (2019) performed a study in which he treated NSLBP patients. In that study three groups were taken in which each group received different interventions along with ergonomic advice. That study concluded that the second group in which the subjects underwent spinal manipulation exercise and ergonomic advice gave better outcomes compared to the other two groups. This can be due to the effectiveness of spinal manipulation exercise. Hence, ergonomic advice given along with other forms of exercise can be fruitful in treating patients with non-specific LBP. A research that was conducted by Shinde SB in the year 2022 invited IT professionals with LBP. The study included participants who sit for work duration of more than 5 hours. It can be seen from that study that people who sit for prolonged time in awkward posture are drastically affected in the low back region.
In a similar study conducted in Saudi Arabia, students who spend more than three hours a day sitting have a 61.5% prevalence of low back pain, compared to 38.5% for students who spend less time sitting. The common risk factor associated with our study has been found to be prolonged sitting for longer hours. This increase in prevalence of low back pain with respect to sitting for longer duration can be due to the stress and tension that falls on back muscles as the muscles in the back are responsible in keeping the body erect. Given that most academic activities are done while seated, sitting time is another crucial consideration. This aggravates pain around low back.

The current study doesn’t categorize the students based on their department that the individual is studying. Ferruh Taspinar, et.al, performed a study in which university students from different departments were investigated for low back pain. The prevalence of low back pain was slightly higher in sports students than in medical students. This can be due to different activities that the students are required to perform during their course.

From the current study spinal extension exercise given to Group A was more effective than ergonomic advice given to Group B. A study conducted by Bajaj M N, et.al, in 2022 compared spinal extension exercise and conventional physiotherapy management in treating mechanical LBP, the result showed that the RMDQ scores were better in the group that received spinal extension exercise. This was due to the increase in strength of the back extensor. Prolonged sitting can decrease core stability and decrease the integrity of back extensors. By this we can come into an understanding that increasing the strength of back extensors can improve the functional involvement in participants with NSLBP.

We have used the McKenzie extension type of exercise alone in managing the Non-specific low back pain. A similar study compared extension type of exercises and flexion type for low back pain in which extension exercises showed better improvement in decreasing pain and improving functional status of the participants.

**Conclusion**

Findings of this study conclude that Spinal extension exercise and ergonomic advice given to each group has a positive effect on participants with Non-specific low back pain among the population. However, spinal extension exercise combined with ergonomic advice appears to be more beneficial than both the exercises given separately.

**Ethical clearance:** Taken from institutional ethical committee. ISRB number-03/ 009/ 2022/ ISRB/ SR/SCPT.

**Funding:** Self

**Conflict of interest:** Nil

**References**


