

Original Article

SEGMENTAL CO-ACTIVATION EXERCISE & ITS FUNCTIONAL ABILITY IN LOW BACK ACHE SUBJECTS

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ABSTRACT

Background: Low back pain is a common problem seen in young female individual. Core strengthening exercises (CSE) helps to activate the deep abdominal & back muscles. Combination of core strengthening & stretching exercise may have positive effects on mechanical low back pain. **Objective:** The main aim of this clinical study is to find the combined effect of core strengthening & stretching exercises on reducing pain & disability on female subjects with mechanical low back pain (MLBP). **Methodology:** 18 female subjects with MLBP who participated in the experimental study underwent treatment variation for 4 weeks after giving their informed consent. They were evaluated & randomized into CSE group, CSE with iliopsoas stretching group, CSE with hamstring stretching group. Protocol-Pre & post VAS & Oswestry scores were recorded at the start of the treatment & at the end of each week for four consecutive weeks. **Data Analysis:** This was done by using parametric test one-way analysis of variance (ANOVA) followed by Post Hoc Bonferroni Significance level set at $p < 0.05$. **Result:** After 4 weeks of exercise therapy there was a significant decrease in pain & disability score among all three groups ($p < 0.01$) with more improved results in core strengthening along with hamstring stretching group ($p < 0.01$). **Discussion & Conclusion:** CSE alone & CSE along with iliopsoas stretching exercise are found to be effective in decreasing pain & disability in subjects with MLBP. Core strengthening exercise along with hamstring stretching showed better results in VAS & Oswestry scale as compared to others groups & found more effective in reducing pain & improving functional activities in MLBP subjects.

KEYWORDS: Mechanical Low Back Pain (MLBP); Core Strengthening Exercise (CSE); Iliopsoas Stretching (ISS); Hamstring stretching (HS); VAS & Oswestry scale.

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INTRODUCTION

Low back pain (LBP) is one of the most common musculoskeletal conditions. In India nearly 60% of people have LBP in some point of their life (Suryapani et al). It is an extremely common health problem & has been considered as the 5th most common cause to visit a clinician. Studies have shown that the incidence of LBP is highest in the 3rd decade of life & its prevalence increases with age until 60–65 age groups and then gradually declines. ^{1, 2}

Low back pain is a common problem. The exact cause cannot be identified in 85-95% of cases.

A precise cause of mechanical back pain can be identified 5-15 % percent of the time. It arise from any one of a number of anatomical structures including bones, intervertebral discs, joints, ligaments, muscles, neural structures and blood vessels. ³

Back pain is of 2 types' mechanical & chemical (non mechanical). Mechanical pain is the general term that refers to any type of back pain caused by placing abnormal stress and strain on muscles of the vertebral column. Typically, mechanical pain results from bad habits, such as poor post-

ure, poorly-designed seating and incorrect bending and lifting motions.⁴

Human beings spend most of their time in flexed position therefore today's society is considered as flexion dominated society. Janda divided muscle into 2 groups' tonic & phasic muscle. These 2 types of muscles are the key words to understand the common patterns of muscle dysfunction. Poor posture leads to muscle imbalance i.e. inhibition of one muscle group followed by facilitation of other muscle group. This is known as lower crossed syndrome.⁵

A stable spine is maintained by high muscular endurance which provides best protection against low back pain. Therefore stability of spine can be achieved by strengthening the core muscles. The 'core' is a group of muscles that surrounds the back and abdomen and is best described as a cylinder of muscles. The main function of the core is to stabilize and protect the spine and pelvis when the rest of the body is in motion. There are 4 main muscle groups that make up the inner core: Transversus Abdominus (TA), Multifidus (MF), Pelvic Floor muscles (PFM), and the Diaphragm⁶

MF is a deep lower back muscle which makes up the back part of the core. It is an important postural muscle that helps keep the spine erect. It is primary intersegmental stabilizers of the spine. Lack of flexibility in distant but connected muscles such as iliopsoas and hamstring is thought to cause reflex inhibition of spinal stabilizing muscles. Reduced flexibility is a predisposing factor for LBP. Inflexibility of the hamstrings exaggerates lumbar lordosis while tightness of the hip flexor limits lumbar lordosis. Therefore the best way to improve flexibility of the muscle is through stretching (hamstrings & iliopsoas).⁷

Thus the present study is designed to find the effect of distant muscle group tightness (iliopsoas and hamstring) so that an effective treatment protocol may be designed and to make people more functionally independent.

MATERIALS AND METHODS

Sample of this clinical research was based on 18-28 year's female subjects with mechanical low back pain (MLBP) with pain intensity on VAS lies 3-5 & Oswestry disability score more than 20 %.

Subjects who have recent spinal surgery past 6 months, who are uncooperative, pathological low back pain were excluded from the study.

The dependant & outcome variables were VAS & Oswestry Disability Index. The Independent variables were segmental strengthening exercises with iliopsoas stretching, segmental strengthening exercises with hamstring stretching.^{7,8}

Procedure

The subjects were assessed & informed consent with ethical approval was taken. They were randomly divided into 3 groups CSE, CSE / ISS, CSE/HS on treatment variation for 4 weeks. Each group consists of 6 subjects. Pre exercise VAS & Oswestry scale was taken and score was recorded. The subjects were educated regarding food items, drinks, clothing & other necessary instructions were given to them before starting exercise protocol.

CSE (Core strengthening exercise) group -The subjects were asked to perform 3 exercises. They were abdominal drawing in maneuver, bridging & crunches. Each exercise was performed with 10 repetitions per set /2 set per session / 1 session / day /5 times per week /4weeks. A period of 1 minute rest interval between each set of exercise was given. VAS & Oswestry scale were taken at the end of every week for 4 weeks.

CSE/ISS (Core Strengthening with Iliopsoas Stretching) group- The subjects were asked to perform iliopsoas stretching (bilaterally) with 30 sec hold / 4 repetitions per session / 1 session / day/ 5 times per week / 4 week. This was followed by cat-camel & bird & dog exercise. Each exercise was performed with 10 repetitions per set /2 set per session / 1 session / day /5 times per week /4weeks. A period of 1 minute rest interval between each set of exercise was given. VAS & Oswestry scale were taken at the end of every week for 4 weeks.

CSE/HS (Core Stretching with Hamstring Stretching) group- The subjects were asked to perform hamstring stretching (bilaterally) with 30 sec hold /4 repetitions per session / 1 session /day/ 5 times per week / 4 week. This was followed by cat-camel & bird & dog exercise. Each exercise was performed with 10 repetitions per set /2 set per session / 1 session / day /5

times per week /4weeks. A period of 1 minute rest interval between each set of exercise was given. VAS & Oswestry scale were taken after every week.

Data Analysis The data analysis was done by using parametric test in the form of one way analysis ANOVA followed by post HOC boneferroni test of VAS & disability score as outcome variables. Significance level VAS set at $p \leq 0.05$.

RESULTS

Table 1: Comparison among all groups on the basis of pre VAS reading.

| Groups | Mean ± SD | F Value | P Value |
|---------|-------------|---------|---------|
| CSE | 4.16 ± 1.17 | 0.17 | 0.84 |
| CSE/ISS | 4.33 ± 0.81 | | |
| CSE/HS | 4.00 ± 0.89 | | |

Table 2: Comparison among all groups on the basis of VAS week-4.

| Groups | Mean ± SD | F Value | P Value |
|---------|-------------|---------|---------|
| CSE | 1.83 ± 0.75 | 11.06 | 0.001 |
| CSE/ISS | 1.66 ± 0.51 | | |
| CSE/HS | 0.33 ± 0.51 | | |

Significance level is $P \leq 0.05$

Table 3: Comparison among all groups on the basis of pre Oswestry score.

| Groups | Mean ± SD | F Value | P Value |
|---------|---------------|---------|---------|
| CSE | 31.00 ± 11.91 | 0.336 | 0.72 |
| CSE/ISS | 32.00 ± 7.37 | | |
| CSE/HS | 35.66 ± 11.27 | | |

Table 4: Comparison among all groups on the basis of oswestry score week-4.

| Groups | Mean ± SD | F Value | P Value |
|---------|--------------|---------|---------|
| CSE | 12.83 ± 3.37 | 3.2 | 0.05 |
| CSE/ISS | 13.33 ± 3.50 | | |
| CSE/HS | 7.16 ± 1.16 | | |

Significance level is $P \leq 0.05$

Fig. 1: Comparison among all groups on the bases of age Variable.

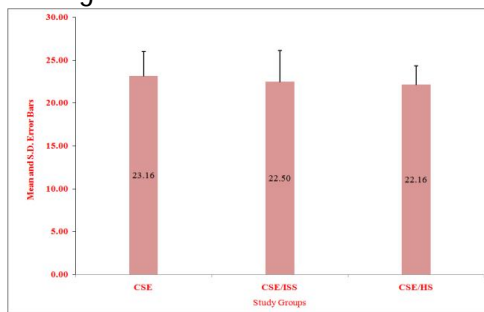


Fig. 2: Post-Hoc Test Bonferroni Test for VAS score week-4.

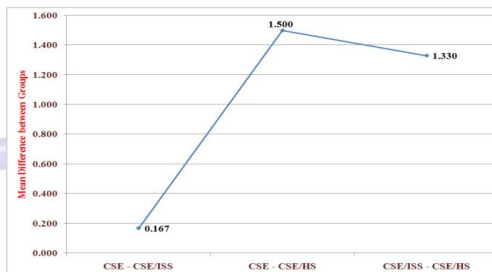


Fig. 3: Figure presenting the result of CSE, CSE/ISS & CSE/HS showing the result of 4 weeks of training on VAS.

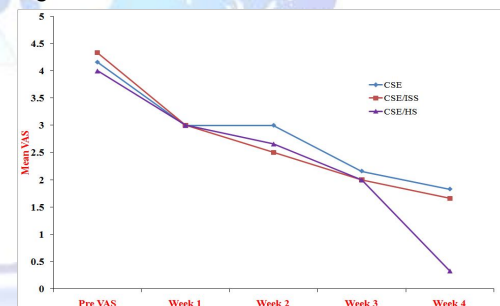


Fig. 4: Post-Hoc Test Bonferroni Test for oswestry score after 4 week.

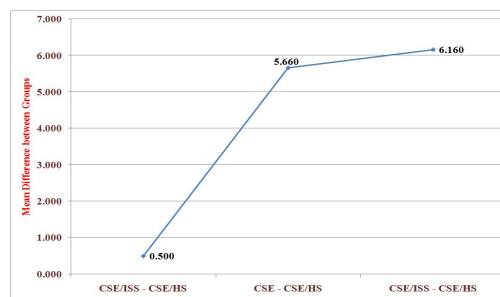
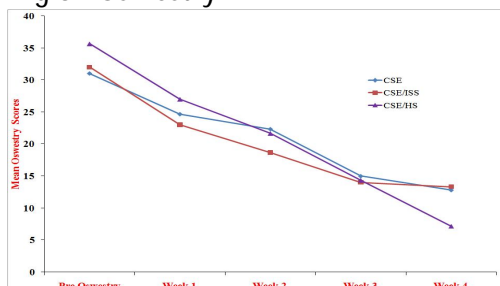


Fig. 5: Figure presenting the result of CSE, CSE/ISS & CSE/HS showing the result of 4 weeks of training on Oswestry.



The findings of our study suggest that combined effect of core strengthening exercise & hamstring stretching is found more significant in MLBP subjects.

DISCUSSION

Comparison among all groups on the bases of base line data

The result analysis of our data is based on the sample size of 18 young female subjects with mean age group of 22.6 & with a mean pain intensity on VAS is 4.16. Stranjalis et al. concluding in their study that mechanical low back pain is commonly seen in young female subject with the moderate intensity in VAS (visual analog scale) of pain.⁸

The study sample have been divided into 3 exercise groups for low back rehabilitation i.e. CSE (Core strengthening exercise), CSE/ISS (Core strengthening exercise with iliopsoas stretching) & CSE/HS (Core strengthening exercise with hamstring stretching) without differentiating on the basis of base line data.

Comparison within CSE (Core Strengthening group)

The result analysis of our data on the basis of VAS (Visual Analog Scale) shows that there is significant decrease in pain level in female subjects by Core strengthening exercise training for 4 weeks.

Aspden et al suggested that co-activation of deep abdominal muscles with lumbar multifidus increases stiffness of the lumbar spine & enhancing its dynamic stability. Studies have shown that by activating the abdominal & multifidus muscle there is decrease in low back pain.⁹

Next important finding of our clinical study result on Oswestry scale shows that there is significant decrease in disability score level by core strengthening exercise training for 4 weeks. E. Rasmussen-Barr et al found that stabilizing exercises are effective in reducing disability in sub acute & chronic LBP.¹⁰

Comparison within CSE/ISS group

The result analysis of our data shows that there is a significant decrease in the level of pain in female subjects by doing core strengthening exercise along with iliopsoas stretching.

Michael V Winters et al suggested that active or passive stretching of tight hip flexor is effective in young patients with LBP.¹¹

Next important finding of our clinical study result on Oswestry scale shows that there is a significant decrease in the level of disability in female subjects by doing core strengthening exercise along with iliopsoas stretching.

Michael V winter suggested that active stretching helps to improve the function of antagonist muscle thereby decreasing LBP & disability.¹¹

Comparison within CSE/HS group

The result analysis of our data shows that there is a significant decrease in the level of pain in female subjects with mechanical low back pain by performing CSE along with hamstring stretching for 4 weeks.

According to Pedro A. Lopez- Minarro hamstring stretching helps to improve the anterior tilting of the pelvis & result in greater lumbar flexion. As the tilt of the spine is corrected & tension is released there is decrease in the level of pain.¹²

Next important finding of our clinical study result on Oswestry scale shows that there is a significant decrease in the level of disability in female subjects by doing core strengthening exercise along with hamstring stretching. According to Pedro A. Lopez- Minarro hamstring stretching helps decrease in the level of disability.¹²

Comparison among CSE, CSE/ISS & CSE/HS group

Jull et al & Strohl et al found that abdominal drawing in exercise helps to activate the deep abdominal muscle with little contribution from rectus abdominis.^{13, 14} Therefore it has been considered an ideal pattern for activating deep abdominal muscle as suggested by Richardson & Jull.¹⁵

Bala K. Gakhar suggested that both stretching & strengthening exercises are equally effective in reducing pain & disability.¹⁶ According to Choisy strengthening & stretching exercise are effective in decreasing low back pain in woman.¹⁷ Felipe et al found that trunk stability exercises are effective in decreasing pain & improves trunk strength in LBP subjects.¹⁸

So core strengthening along with hamstring stretching is found more effective in MLBP subjects.

LBP is an important clinical, social, economic and public health problem affecting the population. Researchers have shown that females more commonly suffer from MLBP. LBP is a major complaint of the world today & majority of time there is some sort of muscular issue that goes along with low back pain & the imbalanced musculature is the root of back pain. The culture of today is society of flexion addicts because most of the time either we spend in sitting or in flexed position. This leads to muscular imbalance which leads to facilitation of one muscle group & inhibition of other muscle group leading to back pain. In order to treat this problem strengthening of abdominal core muscle in combination with stretching of the hamstring is found effective.

Clinical Relevance

LBP is a major problem today the world is facing & there is some type of musculature issue that goes along most of the time with LBP. An imbalanced musculature is mostly the root of back pain. Today's society is considered as flexion dominated society because we spend most of our time in flexed position & this creates LCS (Lower Crossed Syndrome).

The clinical relevance of this study reveals that by correcting the mal-alignment of the pelvic tilt we can decrease pain & disability in mechanical low back pain subjects. In previous studies more emphasis is given to core strengthening exercise for decreasing pain & maintaining stability.

The core strengthening exercise helps to strengthen the weak core muscles while stretching helps us to correct & maintain the normal pelvic tilt. Mechanical LBP is very common among young female subjects due to poor posture & unhealthy life style.

This exercise protocol strengthens the therapeutic field of physiotherapy. This treatment protocol must become a part of LBP prevention & its management & hamstring stretching should become an integral part of this therapeutic regime.

These exercises are very simple, easy to learn & perform. By incorporating these exercises in

their daily routine they can strengthen their back & improve segmental stability which will automatically decrease pain & disability level.

Limitation & Future Study

This study was conducted on a small size. Male subjects were not included in the study. The study was limited to young age group subjects. The future research will emphasize on large sample size which would include both male & female subjects. The subjects can be differentiated on the basis of obesity. Combined effect of core strengthening, iliopsoas stretching & hamstring stretching could be studied.

Conflict of interest

There was no conflict of interest reported among all authors for this clinical research.

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