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To Study the Effectiveness O=of Lumbar Stabilization Exercises Along with Motor Control Exercises on Pain, Endurance, and Flexibility Among Athletes with Nonspecific Low Back Pain

Dr Sumandeep kaur[1], Dr Shilpy Jetly[2], Dr Jaspinder Kaur[3]

[1]Student Masters of physiotherapy Sports Department,DAV Institute of Physiotherapy and Rehabilitation, Jalandhar, Punjab, India
[2]Principal and Professor, DAV Institute of Physiotherapy and Rehabilitation, Jalandhar, Punjab, India
[2]Masters of physiotherapy Sports Department, DAV Institute of Physiotherapy and Rehabilitation, Jalandhar, Punjab, India
[3]Associate Professor, DAV Institute of Physiotherapy and Rehabilitation, Jalandhar, Punjab, India

ABSTRACT

Introduction: Low back pain often keeps the athletes out of training and competition. The treatment of non-specific low back pain has become an essential issue in the field of sports rehabilitation. The activation of particular muscles of the lower back in order to stabilize the lumbar region and to decrease the pain and disability.Motor control retraining refers to neuromuscular control of the body in static postures and functional tasks, based on assumption that impairments in motor control contribute to individual's low back pain.

Objective- The aim and objective was to study the effect of lumbar stabilization exercise along with motor control stabilization exercises on pain, endurance, and flexibility among athletes with nonspecific low back pain.

Methods- 45 athletes with Non-Specific low back pain were divided conveniently into three groups: Group A CG (Control group) was receiving Pulsed SWD and Flexibility exercises, Group B (Experimental group) received Lumbar stabilization exercises(LSE) along with control group and Group C was given Motor control exercises(MCE) along with LSE and CG. The treatment was given for 6 consecutive weeks and readings were taken on 1st 9th and 18th session

Result- The study showed significant improvement in Pain, Endurance and Flexibility following 18 sessions of treatment within both groups

Conclusions- MCE along with LSE group are more effective in reducing the pain, improving the endurance and Flexibility

Keyword: Lumbar stabilization exercises, Motor control exercises, Pulsed Short wave diathermy

INTRODUCTION

More than 80% of people experience Low back pain at some point in their life making it a common musculoskeletal ailment. Although there is a growing body of research on its incidence among athletes, investigations often encounter obstacles. Among these challenges include differing definitions of low back pain (LBP), which may provide different outcomes since they do not take into consideration the pain's intensity, location, and duration, potentially leading to varying results Furthermore, bias can be introduced by study technique problems, particularly in large populations.[1]Specific low back pain (sLBP) is another name for low back pain, which is a prevalent problem in both the general population and sports. This illness commonly causes sportsmen to miss practice sessions and contests.[2]It is acknowledged that low back pain is a common medical condition. It burdens people, families, communities, businesses, and governments as the primary source of activity restriction and work absenteeism. Low back discomfort is one of the most common conditions among professional athletes. According to reports, between 20% and 40% of young athletes in China have low back discomfort, with over 85% of these cases being non-specific and lacking a known pathological structural explanation. With a lifetime incidence of over 80% and a point prevalence of over 28%, low back pain is common in the general population. In sports rehabilitation, treating persistent, non-specific low back pain has become crucial.[3]

Exercises aimed at improving the stability of the lumbar spine have received more attention lately. Although there isn't a single, agreed-upon definition of lumbar stabilization, this method aims to increase the neuromuscular control, strength, and endurance of the muscles that keep the spine and trunk dynamically stable. Along with other paraspinal, abdominal, diaphragmatic, and pelvic muscles, the transverse abdominis and lumbar multifundus are important muscle groups that are addressed.[4]

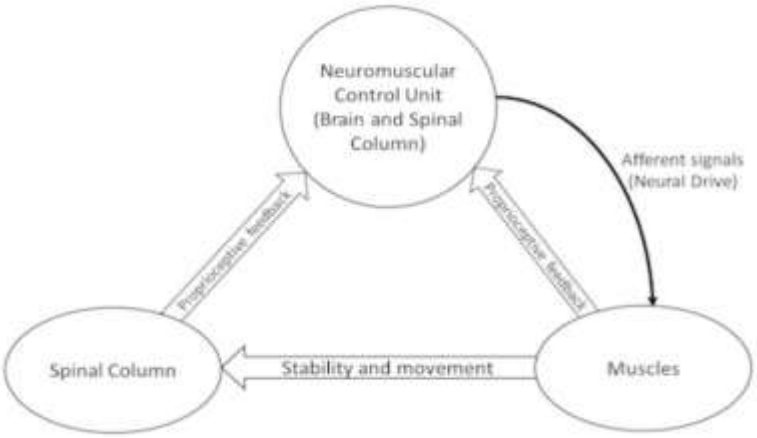

Figure:1.1 Model of spinal stability[14]

The first stabilization program was presented by Richardson et al. in 1999, emphasizing the value of focused exercises meant to engage certain lower back muscles. The goal of these exercises is to lessen discomfort and impairment while stabilizing the lumbar area. Strengthening, stretching, and aerobic workouts are still necessary after segmental stabilization exercises. Although they might not be able to completely restore function or get rid of discomfort, lumbar stabilization treatments are a useful to conventional workout regimens.[5] Lumbar stabilization helps in improving the activation patterns of trunk muscles in order to relieve the lumbar pain and limitation through trunk muscle contraction.

Exercises in particular motor control stabilization exercise (MCE),may increase the functional capacity of all the involved tissues, leading to a protection against neuromuscular-deficient patterns. Thus, the aim is to check the effectiveness of lumbar stabilization exercises and motor control stabilization exercises on pain, endurance, flexibility among athletes with nonspecific low back pain.

METHODOLOGY-

This study was experimental in nature.

Inclusion criteria: Individuals with non-specific low back pain <3 months, Both male and female, age group of 18-35 years, willing to cooperate and participate in the study, Subjects with disc lesion such as prolapsed, protrusion, or herniation without neurological compromise will be included, Orthopaedic conditions such as facet joint arthropathy, sacroiliac joint arthropathy and instability.

Exclusion Criteria**:** Herniated nucleus pulposus, lumbar spondylosis, lumbar spondylolisthesis,(with neurological compromise) Vertebral fracture, hypertension, Coronary artery disease ,Chronic obstructive pulmonary disease, Asthma, laminectomy, discectomy**,** Pregnant Women.

Protocol: A Written consent were obtained from all subjects. Subjects who met inclusion criterion were included in the study and required assessment of every subject were done. Minimum 15 subjects were allocated in each group. The study were performed in Sports Physiotherapy department of DAV Institute of physiotherapy and rehabilitation, Jalandhar. Total duration of study was one and half a year.Pain was assessed with Numeric pain rating scale(NPRS), Endurance with trunk endurance test, flexibility with sit and reach test was measured on 1st session i.e.pre-intervention, post intervention on 9th session and 18th session.

In group A, the choice of treatment was:

- Pulsed SWD and Flexibility exercises

In group B, the choice of treatment was:

- Lumbar stabilization exercises
- Pulsed SWD and Flexibility exercises

In group C, the choice of treatment was

- Pulsed SWD and Flexibility exercises[5]
- Motor Control Exercises[6]
- Lumbar stabilization exercises[7]

Total 18 treatment sessions were given to each group within 6 consecutive weeks.

Results

Data was analysed using SPSS Software. All the data was measured using descriptive statistics.

COMPARISON BETWEEN THE GROUP A, GROUP B and Group C

Figure 2 showed comparison of Numeric Pain Rating Scale between group A, B and C. In Group A, pain levels decreased from a mean of 6.67 at Session-1 to 3.60 at Session-18, but the reduction was not statistically significant ($p = 0.795$). Similarly, Group B showed a decrease from 6.40 to 2.53, yet this change was also not significant ($p = 0.232$). In contrast, Group C experienced a statistically significant reduction in pain from 6.60 to 2.60 ($p = 0.008$), suggesting a more effective intervention.

Figure 3 Showed comparison of Trunk endurance test for flexors between group A, B and C. All three groups showed significant improvement in trunk extensor endurance from Session-1 to Session-18 ($p <$

0.001). Group A showed slight improvement, while Groups B and C demonstrated much greater increases, with Group C showing the highest final mean score (28.73). Pairwise comparisons revealed that both Group B and Group C improved significantly more than Group A at all sessions. Although Group C Outperformed Group B, their difference was not statistically significant.

Fig 4 Showed comparison of Trunk endurance test for extensors between group A, B and C. All three groups showed significant improvement in trunk extensor endurance from Session-1 to Session-18 ($p < 0.001$). Group A showed slight improvement, while Groups B and C demonstrated much greater increases, with Group C showing the highest final mean score (28.73). Pairwise comparisons revealed that both Group B and Group C improved significantly more than Group A at all sessions. Although Group C Outperformed Group B, their difference was not statistically significant.

Figure 5: Flexibility improved across all groups from session-1 to session-18. However, only Group C showed a statistically significant improvement over time ($p = 0.043$), while Groups A and B did not. Pairwise comparisons showed that although Group C had better improvement compared to Group A, the difference was statistically significant only between Group A and B at session-18.

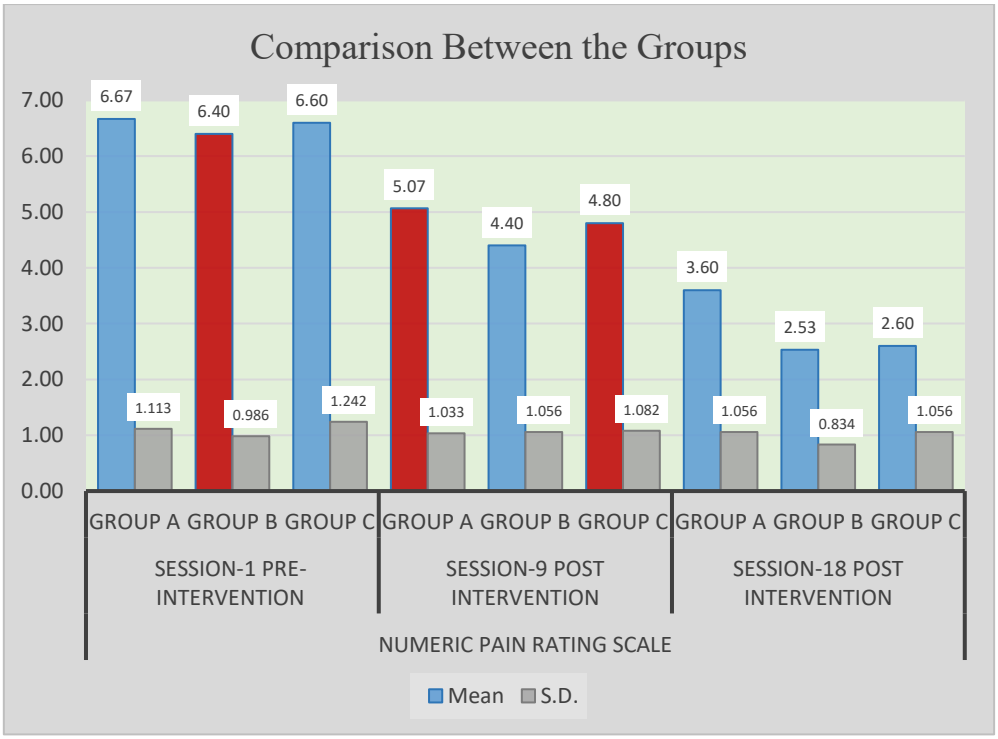

Fig 2 Shows the comparison of NPRS scores for Group A, B and C on Session-1, 9 and 18

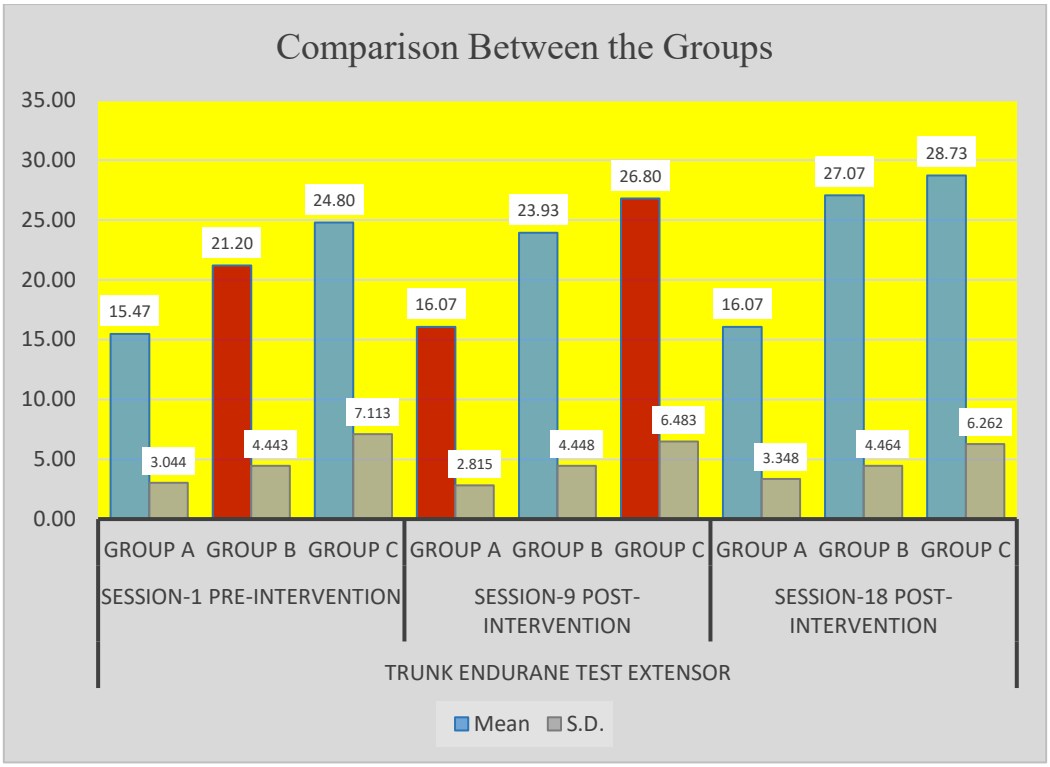

Fig 3 Shows the comparison of Trunk endurance test Extensor scores for Group A, B and C on Session-1, 9 and 18

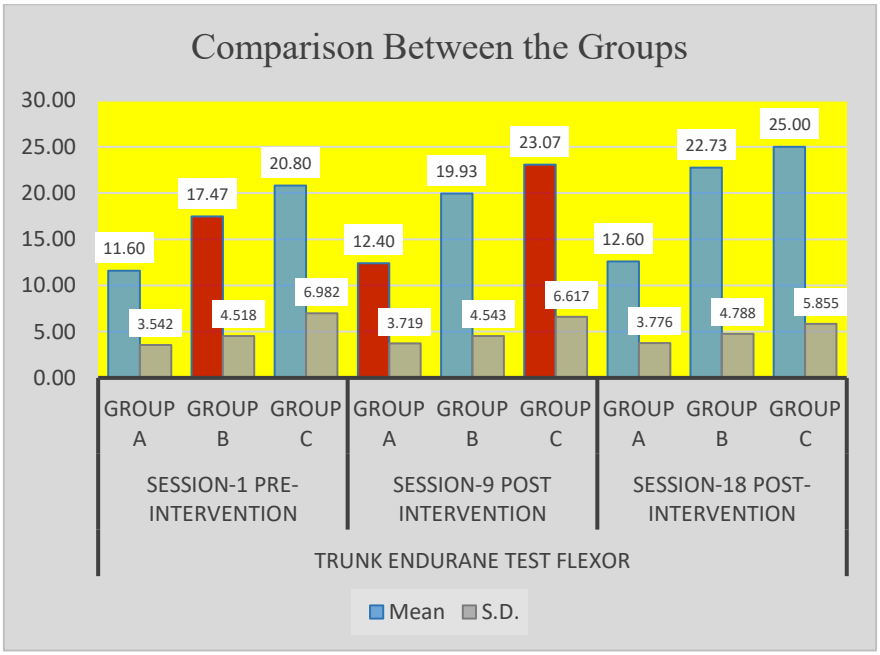

Figure 4Shows the comparison of Trunk endurance test Flexor scores for Group A, B and C on Session-1, 9 and 18

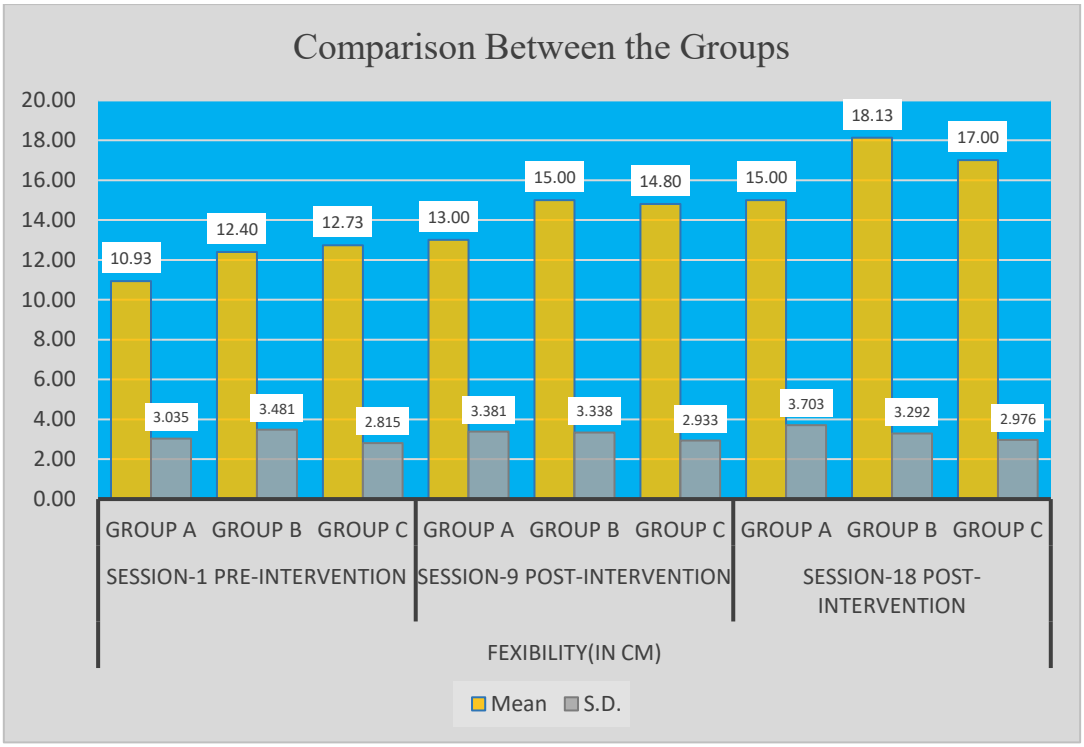

Figure 5 Shows the comparison of Flexibility (in cm for Group A, B and C on Session-1, 9 and 18

DISCUSSION

Low back pain in Group A (Control Group) was significantly improved by 16.60%, 20.37% and 30.33% in session 1st, 9th and 18th of intervention respectively. It Signifies that the interventions (SWD and Flexibility exercises) in Group A were effective in reducing low back pain.

An experimental study conducted by Ahmed Md. S et al.[8]in 2009 on 97 patients with chronic low back pain. Patients were treated with active SWD and Detuned SWD over 6 weeks, there was statistically significant reduction in pain level with p=0.000 It significantly reduces pain, and heat stimulates the tissues to become hotter, which dilates the capillaries and arteries and increases blood flow to the region. The physical characteristics of fibrous tissue, such as that of tendons, joint capsules, scars, and tissues when heated, are significantly altered.Low back pain in Group B (experimental group) showed statistically significant improvement by 15.40%, 24%, 32.96% for session 1st, 9th and 18th respectively. Group B received the Lumbar stabilization exercises along with baseline treatment as given in control group. Abass A O et al.[9] in 2020 investigate the effects of conventional physiotherapy (control group i.e. TENS and infrared) along with lumbar stabilization exercise (experimental group) in individuals having nonspecific low back pain found statistically significant reduction (with p-value<0.001) in low back pain after using Lumbar stabilization exercises along with other interventions for eight weeks as Lumbar stabilization exercises can improve the activation patterns of trunk muscles which helps in relieving the lumbar pain. Low back pain in Group C (experimental group) was significantly improved by 18.8%, 22%,and 40.6% in session 1st, 9th and 18th respectively.Turci A M et al.[10] in 2023 performed a randomized trial over 100 people with chronic nonspecific low back pain allocated into two groups one performing self-stretching exercises and other Motor control exercises reported both groups shows statistically significant reduction in pain of approximately56.5% with Motor control exercises over 26 weeks, as motor control exercises helps to restore control and coordination during workouts, thus concentrating on engaging the deep trunk muscles. They then go on to increasingly challenging and

functional activities that integrate the activation of both the deep and global trunk muscles. group A (Control group) endurance for trunk flexors and extensors were significantly improved with intervention. Trunk endurance for flexor was improved by 30.34%, 29.99%, 29.96%, with p<0.001Trunk endurance for extensor shows statistically nonsignificant improvement by 19.67%, 17.51%, 20.83% with p=0.139 on 1st session, 9th session and 18th session after 6 weeks of intervention respectively.

In Group B (Experimental group) Back muscle endurance was significantly improved by intervention. Trunk Flexor endurance was improved by 25.86%, 22.79%, 21.06%, with p<0.001 trunk extensor endurance by 20.95%, 18.58%, 16.49% with p<0.001 on 1st, 9th and 18th session after intervention over 6 weeks.In Group C (experimental group) trunk muscle endurance was significantly improved. Flexor endurance was improved by 33.56%, 28.68%, 23.42% with p<0.001 whereas Extensor endurance was improved by 28.68%, 24.19%, 21.79% with p<0.001 on 1st session, 9th session and 18th session respectively after 6 weeks of intervention. Brayjani S J et al.[11] in the year2024reported a significant improvement in trunk muscle endurance using Mc gill test with p<0.001 using the motor control Stabilization exercises over 8 weeks after intervention.Si X, Zhang L et al.[12] in2025did a randomized controlled trial to investigate the combined impact of core and pelvic floor muscle training in women with low back pain. 60 females randomized into three groups i.e. control group, Core training group, combined pelvic floor muscle and core training group, there was a statistically significant improvement in trunk muscle endurance for flexors and extensors with p<0.05 in groups of patients giving combined core training and pelvic floor muscle training group. Group A (Control group) flexibility shows significantly improvement over time with intervention by 27.7%, 26%, 24.6% with F=84.210 p<0.001 on 1st session, 9th session and 18th session respectively after 6 weeks of intervention.

Draper D O et al.[13] 2004 reported statistically significant improvement in flexibility over one week of treatment using Shortwave diathermy and Prolonged stretching of lower limb and trunk muscles. Short wave diathermy increases the tissue temperature resulting in elongation of tissue and thus stretching improves ROM increasing the flexibility of low back and hamstrings muscle.In Group B(experimental group) Flexibility is improved statistically significantly by 28.07%, 22.25%, 18.15% with F=271.370, p<0.001over 1st session, 9th session and 18th session respectively after 6 weeks of intervention using Lumbar stabilization exercises along with conventional physiotherapy treatment.In group C (experimental group) there is statistically significant improvement in flexibility by 22.11%, 19.81%, 17.50% on 1st session, 9th session and 18th session respectively with F=218.390 p<0.001 by 6 weeks of intervention using motor control exercises along with lumbar stabilization exercises and conventional treatment.

CONCLUSION

To summarize the results, all the interventions were effective in improving low back pain(NPRS) over a period of 6 weeks in all groups, whereas in comparison to control Group A (SWD, Flexibility exercises), Group B (Lumbar stabilization exercises) and Group C (Motor control exercises) were more effective in reducing low back pain. On comparison of both the experimental groups, Group C (Motor control exercises) were more effective in reducing low back pain as significant differences were observed.All the groups showed an improvement in trunk endurance for flexors and extensors significantly within the group, whereas Group A is not statistically significant in improving trunk endurance for extensors but it has effect on flexors endurance within the group but group B and C shows statistically significant

improvement in Trunk endurance test. On between the group comparison all the group B and C are equally effective in improving the endurance of trunk muscles.

Regarding Flexibility, it was significantly improved in all the groups over time, where between the group there was statistically nonsignificant improvement in flexibility after Group A and B but there was statistically significant improvement in Group C.. To conclude (Group C) Motor control exercises along with lumbar stabilization exercises is more effective in reducing the pain, improving the endurance and flexibility in comparison to group A and Group B.As there is a significant difference between Lumbar stabilization exercises and Lumbar stabilization exercises along with Motor control stabilization exercises in reducing Pain (Alternate hypothesis is accepted), improving Trunk endurance and flexibility (Alternate hypothesis accepted)

LIMITATIONS

- The Small sample size for the study was small.
- Duration of the study was short to see any long-term effect of the given intervention
- No follow up was taken from the subjects

FUTURE SCOPE

- This study will aid in future studies
- This study can be done on large sample size
- The same interventions can be experimented on other specific causes of low back pain
- Long term effects can be evaluated
- Other objective assessment tools can be utilized.

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