



Effectiveness of muscle energy technique versus core stabilization exercises in subjects with non-specific low back pain

D Aiswarya¹, C H Ashok Chakravarthi², P Percy³, L V S Pravallika⁴

¹ Assistant Professor, Department of Orthopedic Physiotherapy, Konaseema Institute of Medical Sciences (BPT & MPT), Amalapuram, Andhra Pradesh, India

² Professor, Department of Orthopedic Physiotherapy, Konaseema Institute of Medical Sciences (BPT & MPT), Amalapuram, Andhra Pradesh, India

³ Department of Orthopedic Physiotherapy, Konaseema Institute of Medical Sciences (BPT & MPT), Amalapuram, Andhra Pradesh, India

⁴ Associate Professor, Department of Orthopedic Physiotherapy, Konaseema Institute of Medical Sciences (BPT & MPT), Amalapuram, Andhra Pradesh, India

DOI: <https://doi.org/10.66856/ijmhr.2026.12.4.12103>

Abstract

Background and objectives: Non-specific low back pain (NSLBP) refers to pain between the lower ribs and buttocks without a specific underlying cause. It may present as dull or sharp pain, sometimes radiating to the buttocks or thighs, and can limit movement. This study aims to compare the effectiveness of Muscle Energy Technique and core stabilization exercises in reducing pain and improving range of motion in individuals with NSLBP.

Materials and method: A total number of 61 subjects, 60 of them met selection criteria for the study and were divided into 2 groups, 30 members in Group A (Muscle energy technique), 30 members in group B (Core stabilization exercises). Both groups performed intervention for 6 weeks. Both groups were also given conventional physiotherapy program for 6 weeks the outcomes of pain, range of motion using VAS and Modified Schober Method.

Result: To test the statistical significance between pre and post test scores paired T test was used. To test the significance of the mean difference of two groups, unpaired t- test was done. It is statistically shown that there is some significant impact on the parameters of pain and range of motion on lumbar spine. The results showed that, Group-A had more significant improvement in all parameters than Group-B.

Conclusion: In this 6-week study, both Muscle energy technique, and Core stabilization exercises Both groups performed intervention for 6 weeks. The outcomes of pain, range of motion using VAS and Modified Schober Method showed significant changes in pain, ROM and functional disability in nonspecific low back pain. However, based on statistical analysis muscle energy technique is more effective than core stabilization exercises in reducing pain and enhancing functional performance in effective in reducing pain and improving range of motion in subjects with non-specific low back pain.

Keywords: Non-specific low back pain, muscle energy technique, core stabilization exercises, VAS and Modified Schober method

Introduction

Non-specific low back pain (NSLBP) is defined as pain in the lower back that is not attributed to any specific or identifiable pathology such as infection, tumor, osteoporosis, fracture, structural deformity, inflammatory disorders, radicular syndrome, or cauda equina syndrome [1]. It is commonly classified into three types based on duration: acute (less than 6 weeks), sub-acute (6–12 weeks), and chronic (more than 12 weeks) [2].

Low back pain is usually felt between the costal margins and the inferior gluteal folds, with or without pain radiating to the lower limbs [3]. More than 85% of low back pain cases are considered non-specific. NSLBP is associated with reduced postural control, which is essential for performing daily functional activities. Postural control depends on the integration of visual, vestibular, and somatosensory systems. NSLBP is a major global public health problem. The lifetime prevalence is about 84%, while chronic low back pain affects around 23% of the population, with 11–12% experiencing disability [4]. The global incidence is approximately 245.9 million cases per year, and the overall prevalence is about 577 million cases worldwide. It is

slightly more common in women, increases with age, peaks between 40–50 years, and rises significantly after 80 years [5].

Common symptoms include dull or sharp pain in the lower back, stiffness, restricted range of motion, radiating pain to the buttocks or thighs, discomfort during bending or lifting, and muscle spasms. Risk factors include physical inactivity, obesity, smoking, and high physical stress at work. Diagnostic procedures may include blood tests, nerve conduction studies, and imaging techniques such as X-rays, MRI, and CT scans, mainly to rule out specific causes.

Management of NSLBP usually begins with conservative treatment such as rest, use of lumbar support, and medications for pain relief. Other treatment approaches include local injections, rehabilitation programs, acupuncture, massage therapy, spinal manipulation, and electrotherapy. Exercise therapy plays an important role in management [6].

Among exercise approaches, muscle energy technique (MET) and core stabilization exercises (CSE) are commonly used [7]. MET involves voluntary isometric contraction of muscles in a controlled manner, leading to post-isometric

relaxation [8]. It helps reduce pain, improve flexibility, decrease muscle tone, enhance circulation, strengthen weak muscles, and improve joint mobility [9, 10]. Core stabilization exercises focus on activating deep trunk muscles, especially the transversus abdominis and lumbar multifidus, which improve spinal stability, increase intra-abdominal pressure, enhance neuromuscular control, reduce pain and disability, and improve posture and proprioception [11-16].

Previous studies have shown the effectiveness of both techniques. Studies have reported that MET is effective in reducing pain and improving joint mobility, while core stabilization exercises improve proprioception, balance, muscle activation, and pain outcomes in individuals with NSLBP [17-18].

Therefore, the aim of this study is to compare the effectiveness of muscle energy technique and core stabilization exercises in individuals with non-specific low back pain.

Materials and methods: Patients diagnosed with non-specific low back pain (NSLBP) and referred to the outpatient physiotherapy department at KIMS General Hospital between December 2023 and December 2024 were included in this study and were retrospectively followed up in the outpatient department until December 2024. A total number of 61 subjects were screened, out of which 60 subjects met the selection criteria and were randomly divided into two groups, with 30 subjects in each group: Group A (Muscle Energy Technique) and Group B (Core Stabilization Exercises). Both groups performed their respective intervention programs for a duration of 6 weeks. The outcome measures assessed were pain and range of motion, measured using the Visual Analogue Scale (VAS) and Modified Schober Method. Inclusion Criteria: - Both male and female subjects aged above 35 years, diagnosed with non-specific low back pain (NSLBP), and willing to participate in the study were included. Exclusion Criteria: - Subjects with spinal deformities, severe low back pain conditions, history of spinal surgery, neurological deficits, or any rheumatologic diseases were excluded from the study.

Procedure

This is a Quasi experimental study which includes 6 weeks protocol. Both male and female participants who are having non-specific low back pain will be recruited from Kim's general hospital, amalapuram. The study is explained individually to the subjects who met inclusion criteria after taking informed consent, the subjects will be divided into two groups. Pretest measures will be taken by using Visual analogue scale, modified Schober's method. Subjects in the group A will receive muscle energy technique (MET) and group B will receive core stabilization exercises. After completion of study duration post-test measurements will be taken after the procedure by Visual analogue scale, modified schober's method. Based on post test measurements will interpret the results.

Intervention Group A: Muscle Energy Technique [27]

1. Met for Iliopsoas: The participant is asked to stand at the edge of the couch. Then, flex the one side hip and knee hold it. The fingers are crossed fold just anterior to the knee joint and then ask the participant to lie down straight on the couch and hold in a flexed position so,

lordosis will be neutralized. On another side of the leg which hangs freely is taken in the abduction and from the restriction area we give MET. So, asked the patient to move the leg upward against resistance. Then, find the new barrier and apply the same procedure.



Fig 1: Met for iliopsoas

2. Met for Quadratus Lumborum: Participant lying supine with the feet crossed at the ankle and heels hanging freely at the edge of the table. Therapist's stabilizing contact on the pelvis. Participant and therapist's hands interlocked in participant's axilla region. Instructed the participant to side bend towards the treated side and apply isometric contraction against resistance. Then, find the new barrier and apply the same procedure.



Fig 2: Met for quadratus lumborum

3. Met for Erector Spinae: To treat the erector spinae the participant should be placed on a fixed stool or chair, in a seated, slumped position, feet flat on the floor, and with the head approximating the knees. The therapist stands behind and to the side and passes an arm across the anterior upper chest from shoulder to shoulder, while the other hand maintains contact with the area of the back that is being treated. To treat the erector spinae, group a restriction barrier is engaged in which the patient is in an easy end-of-range position i.e., a combination of flexion, side bending, and rotation, with the paraspinal muscles close to their end-of-range. Then, very slight attempts to move further in the direction of the restriction barrier, pulsing against the firm and unyielding resistance of the therapist. After a series of mini- contractions and a brief rest, the barrier is reassessed and reengaged, and the process is repeated.



Fig 3: Met for erector spinae

4. **Met for Hamstring:** Participant in supine lying position and therapist stands facing the head of the table. The therapist flexes one side of the hip fully and then extends the flexed knee with the back of the lower leg resting on the therapist's shoulder. Ask the participant to flex the knee, i.e., apply downward pressure against the therapist's shoulder with the back of the lower leg. At the same time, the therapist resists the participant's voluntary effort so developed an isometric contraction of the Hamstring. Then, find the new barrier and apply the same procedure.



Fig 4: Met for Hamstring

Dosage: Then interventions were given five days in a week (total= 30 sessions), 1 session/day for six weeks. Participants received muscle energy technique exercise for 40-45 minutes with 10 seconds hold and 30 seconds rest, 10 rep for each muscle in three sets.

Group B: Core Stabilization Exercises ^[28]

1. **Abdominal Hollowing:** The patient should start in a quadruped position and contract their abdominal muscles by pulling the stomach in, and the contraction is maintained for 10 sec. After that the subject is instructed to come back to his normal position and then relax for 30sec. This exercise is repeated for 10 times in three sets.



Fig 5: Abdominal hollowing

2. **Spine Extension Bridge:** The patient should start in a supine position with knee joints at a 90degrees then the patient lifts the hips off the ground so that the back and thighs are in one stretch, this contraction is maintained for 10 sec. After that the subject is instructed to come back to his normal position and then relax for 30sec. This exercise is repeated for 10 times in three sets.



Fig 6: Spine extension bridge

3. **The Teaser:** The patient should start in a supine position with the knees and hip joints were kept in straight. The trunk is bent to 30degrees the head and shoulders are raised and the contraction is maintained for 10 sec. After that the subject is instructed to come back to his normal position and then relax for 30sec. This exercise is repeated for 10 times in three sets.



Fig 7: The Teaser

4. **Side Bridge:** The patient should start with the side of the body by keeping the side of the ankle and forearm in a stretch position. This contraction is maintained for 10 sec. After that the subject is instructed to come back to his normal position and then relax for 30sec. This exercise is repeated for 10 times in three sets.



Fig 8: Side bridge

5. **Curl UP:** The patient should start with the knees flexed at 90degrees by crossing arms over chest and lifting upper body to 30degrees. This contraction is maintained

for 10 sec. After that the subject is instructed to come back to his normal position and then relax for 30sec. This exercise is repeated for 10 times in three sets.



Fig 9: Curl up

6. **Straight Leg Raising from Prone:** The patient should start in a prone position and then lift one leg by contracting the hip extensor muscles. This contraction is maintained for 10 sec. After that the subject is instructed to come back to his normal position and then relax for 30sec. This exercise is repeated for 10 times in three sets.



Fig 10: Straight leg raising from prone

Dosage: Then interventions were given five days in a week(total=30sessions), 1session/day for six weeks. This exercise can be done for 40-45minutes with 10sec hold

30sec rest for 10 times in three sets.

Group A and B Week Protocol

	MET + Coventional Treatment (Group -A)	CSE + Coventional Treatment (Group-B)
Week 1	Met 1 set/day, {5days} +(conventional treatment) {10 sec hold, 5 rep/day}	CSE 1 set/day, {5days} +(conventional treatment) {10 sec hold, 5 rep/day}
Week 2	Met 1 set/day, {5days} +(conventional treatment) {10 sec hold, 5 rep/day}	CSE 1 set/day, {5days} +(conventional treatment) {10 sec hold, 5 rep/day}
Week 3	Met 1 set/day, {5days} +(conventional treatment) {10 sec hold, 5 rep/day}	CSE 1 set/day, {5days} +(conventional treatment) {10 sec hold, 5 rep/day}
Week 4	Met 1 set/day, {5days} +(conventional treatment) {10 sec hold, 5 rep/day}	CSE 1 set/day, {5days} +(conventional treatment) {10 sec hold, 5 rep/day}
Week 5	Met 1 set/day, {5days} +(conventional treatment) {10 sec hold, 5 rep/day}	CSE 1 set/day, {5days} +(conventional treatment) {10 sec hold, 5 rep/day}
Week 6	Met 1 set/day, {5days} +(conventional treatment) {10 sec hold, 5 rep/day}	CSE 1 set/day, {5days} +(conventional treatment) {10 sec hold, 5 rep/day}

Conventional therapy

The conventional therapy is given for both the groups A and B. The stretching exercises are given as conventional

therapy that includes quadriceps stretch, hip flexor stretch, adductor stretch, hamstring stretch and cat camel exercises. Each stretch is hold for 10 sec, 5 rep/day for 6 weeks ^[29]



FIG 11: Hamstring stretch



Fig 12: Adductor stretch



Fig 13: Hip flexor stretch



Fig 14 & 15: Cat and camel exercises



Fig 16: Qaudriceps stretch

Statistical Analysis & Results

Statistical analysis was performed by using SPSS software version 21.0 and Microsoft Excel 2007, with significance level kept at 0.05. Descriptive statistical data were presented in the form of mean $\pm$ standard deviation and mean difference percentages were calculated and presented. All 60 subjects completed the entire study program as defined by 6weeks in the Outpatient basis. To observe the treatment impact before and after the treatment in the groups, analysis is carried out by using Paired t- test.

Between the Groups: independent student t test was performed to assess the statistically significant difference in mean value between the groups muscle energy technique and core stabilization exercises.

Within the Group: Paired t test was performed to assess the statistical difference with in the group for muscle energy technique and core stabilization exercises.

Combined Statistical Analysis Table

Outcome	Group	Pre-Mean	Pre SD	Post Mean	Post SD	t	p
VAS Pain	MET	5.5	1.10	1.9	1.04	0	<0.05*
VAS Pain	CSE	5.4	1.13	3.7	1.28	0	<0.05*
VAS Post	A vs B	1.9	1.04	3.7	1.28	-11	<0.05*
Flexion	MET	2.3	2.12	3.2	0.71	-4	<0.05*
Flexion	CSE	1.8	0.60	2.3	0.60	-9	<0.05*
Flexion Post	A vs B	3.2	0.71	2.3	0.66	0	<0.05*
Extension	MET	1.36	0.35	2.11	0.20	-4	<0.05
Extension	CSE	1.42	0.33	1.83	0.25	-7	<0.05
Extension Post	A vs B	2.11	0.20	1.83	0.25	-11	<0.05

* p < 0.05 indicates statistically significant difference.
MET = Muscle Energy Technique; CSE = Core Stabilization Exercises.

Discussion

The aim of the study was to assess the effectiveness of muscle energy technique versus core stabilization exercises in decreasing pain and improving flexibility in subjects with nonspecific low back pain. Various therapeutic approaches have been used to reduce the low back pain symptoms and improve physical function related to activities of daily living. Some evidence suggests that muscle energy technique and core stabilization exercises may produce better results in symptomatic relief and functional performances in comparison to traditional therapeutic exercises.

In present study 60 subjects were recruited and randomly assigned into two groups i.e., 30 subjects for group A (Muscle energy technique) and 30 subjects for group B (Core stabilization exercises) both male and female are included with the age group between 20 to 50 were selected then interventions were given five days in a week (total=30 sessions), 1 session/day for six weeks. This exercise can be done for 40-45 minutes with 10 sec hold 30 sec rest for 10 times in three sets for both the groups. Pain and flexibility of the lower back were measured before and after the intervention. The outcome measures used are VAS for pain and modified Schober method for flexibility.

After the intervention of group, A (MET) there is significant decrease in pain (VAS) and increased flexibility (modified Schober method) were seen. According to Priyankadhargalkar *et al* states that MET is effective in decreasing pain via the production of joint movement, or stretching of the joint capsule, which may be capable of reducing pain by inhibiting the stronger diameter nociceptive neuronal input at the spinal cord level.

The possible mechanism for the reduction in pain intensity can be attributed to the hypoalgesia effect. This can be explained by the inhibitory Golgi tendon reflex, activated during the isometric contraction that leads to reflex relaxation of the muscle, and activation of the muscle and joint mechanoreceptors leads to sympathoexcitation evoked by somatic efferent and localized activation of periaqueductal gray matter which decreases the pain. At the dorsal horn of spinal cord nociceptive inhibition takes place, simultaneously pain gate theory also occurs due to mechanoreceptor stimulation^[30].

H. Shaker *et al* states that MET improves the lumbar range of motion which mainly works on reducing spasm or tightness of muscle by first resetting the muscle spindle and inhibiting the muscles by activating the Golgi tendon. The proposed mechanism by which passive manual stretch facilitates the laying down of collagen and regain of muscle length are direct viscoelasticity changes from the decreased actin-myosin cross bridging. The effect of MET for an increase in range of motion can be explained based on physiological mechanisms behind the changes in muscle extensibility reflex relaxation viscoelastic changes and changes to stretch changes. A combination of contractions and stretches might be more effective for producing viscoelastic changes because the forces could produce increased viscoelastic change^[31] After the intervention for six weeks in group B (CSE) there is a decrease in the pain intensity and increased flexibility in the lower back. The improvement in core stabilization exercises group might be due to retraining transversus abdominis and lumbar multifidus muscles, which possibly increased the muscle activity of those muscles, and stimulating muscle spindles

and joint receptors, thereby improving the accuracy of the sensory motor integration procedure and initiating precise joint repositioning^[32]. Puntumetakul *et al* states that re-educating the core muscles which have a rich source of sensory input and provides postural and balance control. Therefore, core stabilization exercises may help patients to recover from their neuromuscular dysfunction, improve the somatosensory processes that restore kinesthetic awareness^[33].

According to Kong *et al*, states that core stabilization exercises may increase muscle thickness by activating the lumbar multifidus muscles and motor control capacity in patients with non-specific low back pain^[34]. Previous investigators have postulated that core stabilization exercises with Abdominal drawing in maneuver can minimize compensation, effectively increase abdominal muscle thickness and improve balance and spinal stability^[35]. The results of the present study support these findings; the CSE program may increase the percentage change of muscle thickness of the core muscles.

According to Bystrom *et al* states that CSE improves activation and coordination of the trunk muscles, enhances the stability of the lumbar segment, and reduces spinal overload pain, and functional disability^[36]. The CSE can improve back movement performance by reducing pain, which may improve the accuracy of joint repositioning sense and reduce functional disability.

Hence the null hypothesis is rejected & alternate hypothesis is accepted.

Limitations of the Study

The limitations of the study were small sample size.

Implications of Future Research

In future long term follow up with large sample size, older age groups, and higher level of pain.

The other outcomes with the use of electrical modalities.

Conclusion

This study concludes that muscle energy technique is effective in reduction pain and improving range of motion (ROM) in subjects with non-specific low back pain. Individually both the groups were found to be effective in reducing pain, improving range of motion, however when both groups were compared, there was a significance of group-A with greater mean than group B. Hence, it can be concluded that muscle energy technique is more effective in treating non-specific low back pain.

References

1. Fahmy E, Shakar H, Ragab W, Helmy H. Efficacy of spinal extension exercise program versus muscle energy technique in the treatment of chronic mechanical low back pain, 2019, 55(1)
2. Dhargalkar P, Kulkarni A, Ghodey S. Effect of muscle energy technique for improving functional ability in patients with chronic non-specific low back pain, 2017;5(3):2082–2087
3. Balague F, *et al*. Non-specific low back pain. The Lancet, 2012;379(9814):482–491.
4. Burton AK, Tillotson KM, Main CJ, Hollis S. Psychosocial predictors of outcome in acute and subchronic low back trouble. Spine (Phila Pa 1976), 1995;20(6):722–728.

5. Allegrì M, De Gregori M, Minella C, Klersy C, Wang W, Sim M, *et al.* 'Omics' biomarkers associated with chronic low back pain, Protocol of a retrospective longitudinal study. *BMJ Open*,2016;6(10):1–8.
6. Henschke N, Kamper SJ, Maher CG. The epidemiology and economic consequences of pain. *Mayo Clinic Proceedings*,2015;9:139–147.
7. Hoy D, March L, Brooks P, Blyth F, Woolf A, Bain C, *et al.* The global burden of low back pain, Estimates from the Global Burden of Disease 2010 study. *Annals of the Rheumatic Diseases*,2014;6(73):982–989.
8. Koes BW, van Tulder MW, Thomas S. Diagnosis and treatment of low back pain. *BMJ*,2006;332:1430–1434.
9. Becker BA, Childress MA. Non-specific low back pain and return to work. 2019;100(11):697–70
10. Greenman P. *Prindicine*. 3rd ed. 2003
11. Nature P, Welling A. Effect of gross myofascial release of upper limb and neck on pain and function in subjects with mechanical neck pain with upper limb radiculopathy, A clinical trial. *International Journal of Dental and Medical Research*,2014;1(3):8–16.
12. O'Leary S, Falla D, Jull G. The relationship between superficial muscle activity during the cranio-cervical flexion test and clinical features in patients with chronic neck pain. *Manual Therapy*,2011;16(5):452–455.
13. Vleeming A, Schuenke MD, Danneels L, Willard FH. The functional coupling of the deep abdominal and paraspinal muscles, The effects of simulated paraspinal muscle contraction on force transfer to the middle and posterior layer of the thoracolumbar fascia. *Journal of Anatomy*,2014;225(4):447–462.
14. Tsao H, Druitt TR, Schollum TM, Hodges PW. Motor training of the lumbar paraspinal muscles induces immediate changes in motor coordination in patients with recurrent low back pain. *Journal of Pain*,2010;11(11):1120–1128.
15. The effects of the CORE programme on pain at rest, movement-induced and secondary pain, active range of motion, and proprioception in female office workers with chronic low back pain, A randomized controlled trial. *Clinical Rehabilitation*, 2015, 29(7).
16. Tsao H, Hodges PW. Persistence of improvements in postural strategies following motor control training in people with recurrent low back pain. *Journal of Electromyography and Kinesiology*,2008;18(4):559–567.
17. Hofman SL, Johnson MB, Zou D, Harris-Hayes M, Van Dillen LR. Effect of classification-specific treatment on lumbopelvic motion during hip rotation in people with low back pain. *Manual Therapy*,2011;16(4):344–350.
18. Salavati M, Akhbari B, Takamjani IE, Bagheri H, Ezzati K, Kahlaee AH. Effect of spinal stabilization exercise on dynamic postural control and visual dependency in subjects with chronic non-specific low back pain,2016;20(2):441–8003.
19. Patel S, Khatri S, Patel P. Effectiveness of muscle energy technique as compared to proprioceptive neuromuscular facilitation in non-specific low back pain,2022;9(3):173182.
20. Suhlaing S, Puntumetakul R. Effects of core stabilization exercise and strengthening exercise on proprioception, balance, muscle thickness and pain related outcomes in patients with subacute non-specific low back pain,2021;22:998:1–13
21. Williams R, Binkley J, *et al.* Reliability of the modified Schober and double inclinometer method for lumbar flexion and extension,1993;3(1):33–38.
22. Krismer M, van Tulder M, *et al.* Non-specific low back pain,2007;21(1):1–9.
23. Aoki Y, Shirotsugiura, *et al.* Non-specific low back pain using a detailed visual analogue scale for patients in motion, standing and sitting. 2012;(10):680–684.
24. Fahmy E, Shakar H, *et al.* Efficacy of spinal extension exercise program versus muscle energy technique in treatment of chronic mechanical low back pain. 2019+;55(77):7855
25. Aiminwu, March L, *et al.* Global low back pain prevalence and years lived with disability from 1990 to 2017,2020;8(6):250–254.
26. Suhlaing S, Puntumetakul R, *et al.* Effects of core stabilization exercise and strengthening exercise on proprioception, balance, muscle thickness and pain related outcomes in patients with subacute non-specific low back pain,2021;22:998:266–270
27. Shreyapateel, Subhash, *et al.* Effectiveness of muscle energy technique as compared to proprioceptive neuromuscular facilitation in non-specific low back pain,2022;9(3):245–249.
28. Khalid, Yousef, Shehre, *et al.* Effectiveness of spinal stabilization exercises on movement performance in adults with chronic low back pain. *International Journal of Sports Physical Therapy*,2023;18(1):465–469.
29. Goodridge JP. Muscle energy technique, Definition, explanation, methods of procedure. *Journal of the American Osteopathic Association*,1981;81(4):249–254.
30. Kisner C, Colby LA, Borstad J. *Therapeutic exercise, Foundations and techniques*. FA Davis, 2017.
31. Amundsen P, Evans D, Rajendran D, *et al.* A review of randomized controlled trials published between 2006 and 2012. *BMC Musculoskeletal Disorders*, 2018, 19(1).
32. Fahmy E, Shakar H, Ragab W, Helmy H. Efficacy of spinal extension exercise program versus muscle energy technique in the treatment of chronic mechanical low back pain, 2019, 55(1).
33. Dhargalkar P, Kulkarni A, Ghodey S. Effect of muscle energy technique for improving functional ability in patients with chronic non-specific low back pain,2017;5(3):2082–2087
34. Kong YS, Cho YH, Park JW. Changes in the activities of the trunk muscles in different kinds of bridging exercises,2013;25(12):1609–1612.
35. Salavati M, Akhbari B, Takamjani. Effect of spinal stabilization exercise on dynamic postural control and visual dependency in subjects with chronic non-specific low back pain,2016;20(2):441–448.
36. Tsao H, Druitt TR, Schollum TM, Hodges PW. Motor training of the lumbar paraspinal muscles induces immediate changes in motor coordination in patients with recurrent low back pain,2010;11(11):1120–1128.
37. Browne J, O'Hare N. Development of a novel method for assessing balance, The quantitative posture graphy system,2000;21(4):525–534.
38. Kong YS, Jang GU, Park S. The effects of prone bridge exercise on the Oswestry disability index and proprioception of patients with chronic low back pain,2015;27(9):2749–2752.
39. Dhargalkar P, Kulkarni A, Ghodey S. Effect of muscle energy technique for improving functional ability in patients with chronic non-specific low back pain. 2017;5(3):2082–2087.