



EVALUATING THE EFFICACY OF OSTEOPATHIC MANIPULATION TECHNIQUES ON CORRECTING MUSCULAR IMBALANCE AND PELVIC ALIGNMENT IN AMATEUR ATHLETES WITH LOWER CROSSED SYNDROME

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ABSTRACT

Background: Lower Crossed Syndrome (LCS) is a prevalent postural imbalance among amateur athletes, characterized by tight hip flexors and lower back extensors, along with weak gluteal and abdominal muscles. These muscular imbalances contribute to anterior pelvic tilt, compromised stability, and increased injury risk. Osteopathic Manipulation Techniques (OMTs) offer a holistic therapeutic approach targeting these biomechanical dysfunctions.

Objective: To evaluate the efficacy of osteopathic manipulation techniques in correcting muscular imbalance and improving pelvic alignment among amateur athletes diagnosed with LCS.

Methods: Forty-five amateur athletes aged 20–40 years with clinically diagnosed LCS participated in a two-week intervention involving various OMTs including Muscle Energy Techniques (MET), diaphragmatic and peritoneal release, and cranial rhythmic techniques. Outcome measures included pelvic tilt (PALM Pelvic Inclinator), iliopsoas tightness (Modified Thomas Test), and gluteus maximus strength and hamstring flexibility. Pre- and post-intervention scores were compared using paired t-tests.

Results: Significant improvements ($p < 0.01$) were observed in pelvic alignment, gluteus maximus strength and hamstring flexibility. OMTs effectively corrected postural asymmetries and enhanced neuromuscular control.

Conclusion: Osteopathic manipulation techniques effectively address muscular imbalance and pelvic misalignment in amateur athletes with LCS, enhancing functional performance and reducing injury risk. Integrating OMT into athlete conditioning programs could yield preventive and rehabilitative benefits.

Keywords: Osteopathic Manipulation, Lower Crossed Syndrome, Pelvic Alignment, Muscle Energy Technique, Amateur Athletes, Balance

INTRODUCTION:

Lower Crossed Syndrome (LCS) is a common postural dysfunction characterized by muscular imbalance around the lumbopelvic region, involving tightness of the hip flexors and lumbar extensors with concurrent weakness of the abdominal and gluteal muscles (Janda, 1987). This imbalance leads to an anterior pelvic tilt, compensatory lumbar lordosis, and altered biomechanical loading of the spine and pelvis, predisposing individuals to chronic low back pain, sacroiliac joint dysfunction, and reduced athletic performance (Page, Frank, & Lardner, 2010; Liebenson, 2014).

Athletes, particularly those engaged in repetitive lower limb and core-dominant activities, are at higher risk for developing LCS due to asymmetrical movement patterns, overtraining, and inadequate flexibility training (Kibler, Press, & Sciascia, 2006). The persistent imbalance between tonic (postural) and phasic (dynamic) muscle groups not only affects posture and mobility but also impairs neuromuscular control, which can hinder optimal force generation and increase susceptibility to overuse injuries. Hence, a therapeutic approach that corrects both the structural and functional components of this syndrome is essential.

Osteopathic Manipulative Techniques (OMT) are manual therapy interventions designed to restore normal anatomical relationships and optimize physiological function by addressing somatic dysfunctions of the musculoskeletal system (Ward, 2015). Among these, Muscle Energy Techniques (MET), joint mobilization, and fascial and visceral release methods have shown promising results in improving range of motion, muscle strength, and postural symmetry (Chaitow & DeLany, 2011; Licciardone et al., 2013). MET, in particular, utilizes controlled isometric contractions to lengthen shortened muscles and enhance joint mobility through reciprocal inhibition and post-isometric relaxation mechanisms.

The thoracolumbar fascia release, sacroiliac joint mobilization, and lumbar mobilization techniques are employed to reduce fascial restriction and improve segmental mobility, which play key roles in pelvic and spinal stability. In addition, visceral techniques such as diaphragm and peritoneum recoil are believed to restore myofascial continuity and optimize respiratory-pelvic coordination, indirectly enhancing postural control. Despite the widespread clinical use of these techniques, there remains a paucity of empirical evidence validating their combined effect on muscular balance and pelvic alignment, particularly among athletic populations.

Therefore, this study aims to evaluate the efficacy of a comprehensive osteopathic manipulative treatment protocol—comprising MET, myofascial release, joint mobilization, and visceral recoil techniques—on correcting muscular imbalance and pelvic alignment in amateur male athletes diagnosed with Lower Crossed Syndrome. It is hypothesized that this integrative osteopathic approach would significantly improve pelvic symmetry, muscle flexibility, and strength, thereby promoting postural balance and functional performance.



Fig.1: Lower cross syndrome

METHODOLOGY:

STUDY DESIGN

Single group pre & post-experimental

STUDY SUBJECTS

Amateur athletes, aged 18 to 35 years

Participant preparation:

A total of 30 amateur athletes with clinically diagnosed with LCS were recruited. Inclusion criteria included anterior pelvic tilt and muscular imbalance consistent with LCS presentation.

Study Tools:

PALM Pelvic Inclinometer: The PALM device, a combination of caliper and inclinometer, was used to measure the anterior pelvic tilt by assessing the angle between the ASIS and PSIS. It is a reliable and valid tool with high inter- and intra-rater reliability for evaluating pelvic alignment in both sagittal and frontal planes.

Goniometer: The Modified Thomas Test was conducted to assess the tightness of the hip flexors, especially the iliopsoas, with hip extension range of motion measured using a goniometer.



Fig 2. Palm Pelvic Inclinometer

INTERVENTION:

MET for Iliopsoas:

Patient supine near table edge; opposite leg held to chest while therapist extends test leg. Patient performs gentle isometric hip flexion against resistance (and resisted external rotation), repeated 5–10 sec contractions with relaxation and stretch.

Anterior rotation dysfunction of iliac technique

Patient supine, performs bridge to square pelvis. Therapist checks leg length (longer leg=anterior rotation). Involved leg flexed 40–50°, supported under axilla; patient performs 20% isometric hip extension for 5–10 sec, repeated twice. Correction confirmed when malleoli levels equalize.

Sacroiliac Joint Mobilization:

Patient lies left lateral, knees together. Therapist stands in front, monitors lumbosacral junction. Left hand contacts left ILA, right hand pulls shoulder anterior–caudad to induce spinal rotation. A cephalic thrust is delivered through the left forearm parallel to the table to mobilize the SI joint.

Lumbar Mobilization:

Patient in left lateral position; therapist in front. Legs flexed to ease lumbar motion. Therapist induces left side-bending and right rotation, localizes at the dysfunctional segment, and then applies a quick anterior rotary thrust through the left forearm and body drop to restore mobility.

Hamstring MET:

Affected leg flexed at hip and knee, then extended to the barrier. Patient performs 25% isometric contraction for 7–10 sec, relaxes, then therapist extends the leg further during exhalation, holding stretch for 30 sec.

Gluteus Maximus MET:

Patient supine, hip flexed and externally rotated. Therapist resists gentle 20% isometric gluteal contraction for 7–10 sec, followed by relaxation and deeper stretch. Repeat for improved activation and flexibility.

Thoracolumbar Fascia Release:

Patient prone, arms and feet relaxed. Therapist places hands on both sides of the thoracolumbar junction, applies gentle compression, moving one hand clockwise and the other counterclockwise to engage tissue barriers. Maintain until release and skin blush appear, then reassess mobility.

Diaphragm Recoil:

Patient lies supine; therapist stands at the side, placing fingertips under the costal arch on both sides while stabilizing the lower rib cage. Gentle cephalic pressure is applied to the diaphragm—inhale is resisted, exhalation encouraged—until tissue release is felt.

Peritoneum Recoil:

Patient supine with knees bent; therapist uses a pinch grip to lift and stretch the abdominal wall and peritoneum anteriorly, feeling tension toward the spine. The gentle pull is held up to 1 minute and may be applied regionally, with care due to potential discomfort.

Duration: Intervention will be given for 2 Weeks for 2 Days in a week. Each session will last for one hour.

RESULTS AND ANALYSIS

TABLE .1 Comparison of Pretest & Posttest scores of different Variables by Paired t test

Parameter	Mean $\pm$ SD (Pre)	Mean $\pm$ SD (Post)	Paired t-test	p-value
PALM (Pelvic Alignment)	4.25 $\pm$ 0.61	2.00 $\pm$ 0.00	t =20.20	p < 0.001
Rt. Thomas Test	14.84 $\pm$ 2.53	25.06 $\pm$ 3.61	t = 17.07	p < 0.001
Lt. Thomas Test	10.56 $\pm$ 2.50	21.24 $\pm$ 2.49	t = 19.94	p < 0.001
Rt. Gluteus Max Strength	4.17 $\pm$ 1.56	6.62 $\pm$ 1.56	t= 8.60	p < 0.001
Lt. Gluteus Max Strength	2.67 $\pm$ 0.81	4.34 $\pm$ 0.98	t = 10.08	p < 0.001
Rt. Hamstring Flexibility	144.14 $\pm$ 18.33	156.95 $\pm$ 15.44	t = 4.11	p = 0.0003
Lt. Hamstring Flexibility	146.81 $\pm$ 18.19	153.19 $\pm$ 15.93	t = 2.03	p = 0.051

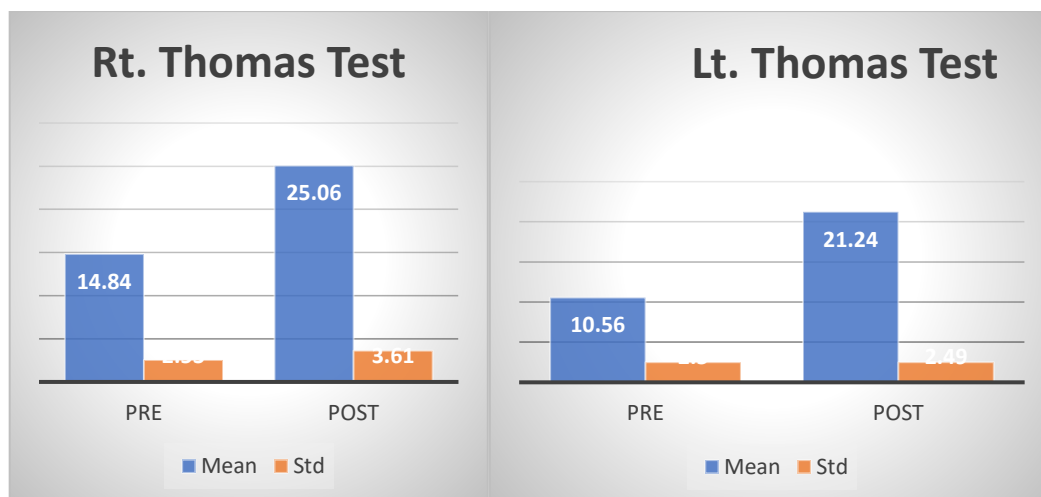


Fig. Graph represent pre and post intervention scores of modified Thomas Test in Rt. and Lt. leg

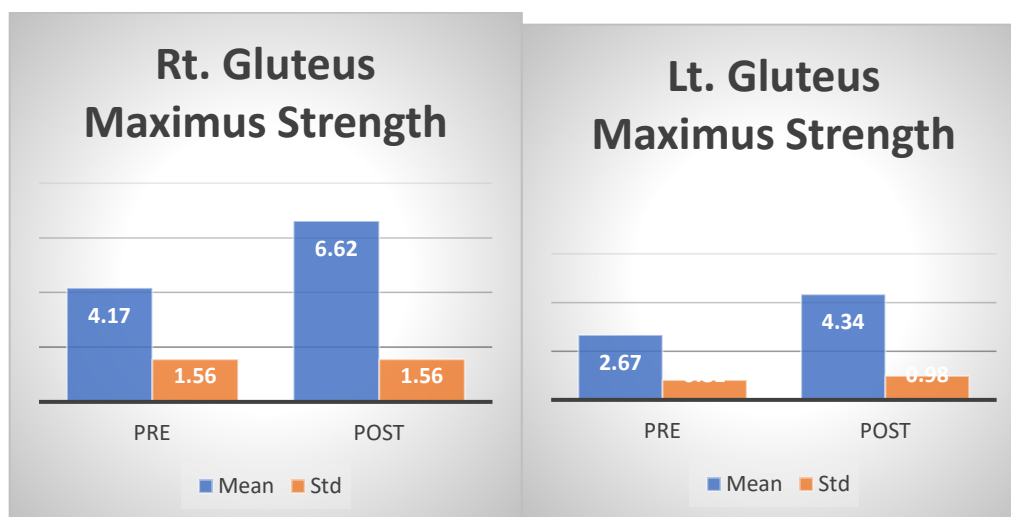


Fig. Graph showing pre and post intervention scores of Rt. and Lt. Gluteus Maximus Strength

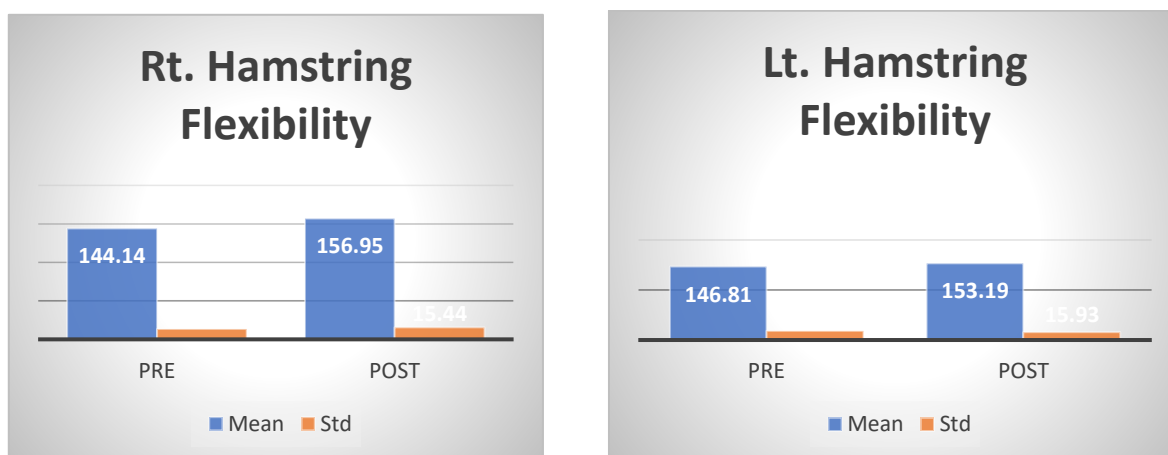


Fig. Graph showing pre and post intervention Scores of Rt. and Lt. Hamstring Flexibility

DISCUSSION:

The present study aimed to evaluate the efficacy of a structured osteopathic manipulative treatment (OMT) protocol—including techniques such as MET for psoas and hamstrings, gluteal activation, thoracolumbar fascia release, lumbar and sacroiliac mobilization, and visceral techniques (diaphragm and peritoneum recoil)—in improving muscular balance and pelvic alignment among male athletes presenting with Lower Crossed Syndrome (LCS).

The results demonstrated statistically significant improvements across most parameters following intervention. The Pelvic Alignment and Leveling Measurement (PALM) scores reduced markedly ($p < 0.001$), indicating substantial correction in anterior pelvic tilt and asymmetry. These findings are in agreement with previous evidence suggesting that pelvic repositioning and myofascial balance play a crucial role in restoring optimal postural alignment (Page et al., 2010; Liebenson, 2014).

The Thomas test values, representing hip flexor length, showed significant improvement bilaterally ($p < 0.001$), suggesting effective inhibition of hypertonic iliopsoas and rectus femoris through MET and fascial release. This supports the hypothesis that addressing shortened hip flexors through active muscle energy and myofascial techniques can normalize pelvic orientation and reduce compensatory lumbar lordosis (Chaitow & DeLany, 2011).

Similarly, gluteus maximus strength improved significantly on both sides ($p < 0.001$), reflecting enhanced activation and neuromuscular re-education of inhibited extensor muscles. Strengthening of the posterior chain musculature, particularly the gluteus maximus, is crucial in counteracting anterior pelvic tilt and improving lumbo-pelvic stability (McGill, 2015).

Hamstring flexibility also demonstrated improvement on both sides; however, while the right side showed a highly significant change ($p < 0.001$), the left side improvement was marginal ($p = 0.051$). This asymmetry may reflect pre-existing dominance patterns or incomplete fascial adaptation on one side. Future sessions or prolonged follow-up may yield more symmetrical gains.

Overall, the combination of osteopathic structural and visceral manipulative techniques appeared to improve the functional biomechanics of the lumbopelvic region, decrease muscular tension, and enhance flexibility and strength of the key muscle groups involved in LCS. These outcomes align with the osteopathic principle of restoring somatic harmony by addressing the interrelationship between structure and function (Ward, 2015).

The present findings suggest that an integrated osteopathic protocol is an effective, non-invasive management strategy for Lower Crossed Syndrome among amateur male athletes. Nonetheless, limitations include the absence of a control group, short-term assessment, and small sample size. Further randomized controlled trials are recommended to substantiate the long-term effects and compare osteopathic interventions with conventional physiotherapy or exercise-based protocols.

CONCLUSION:

The study concluded that a targeted osteopathic manipulative treatment protocol significantly improves pelvic alignment, muscle flexibility, and strength in male athletes with Lower Crossed Syndrome. The observed reductions in pelvic asymmetry and increases in hip flexor length and gluteal strength suggest that restoring musculoskeletal balance through manual therapy can correct the biomechanical dysfunctions characteristic of LCS.

Therefore, osteopathic techniques such as MET, thoracolumbar fascia release, joint mobilizations, and visceral recoil methods may serve as effective adjuncts in the clinical management of postural and muscular imbalance among athletes. Continued clinical application and research with larger sample sizes and follow-up assessments are warranted to confirm their therapeutic value.

CONFLICT OF INTEREST:

None

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None

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