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Central Postero Anterior Glide with Static Hamstring Stretch Versus Sustained Natural Apophyseal Glides with Two Leg Rotation in Nonspecific Low Back Pain:- A Randomized Controlled Trial Study

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KEYWORDS
Non-Specific Low Back Pain, Central Postero Anterior Glide, Sustained Natural Apophyseal Glides, Two Leg Rotation, Lumbar Stabilization Exercise, Hamstring Stretch.

ABSTRACT:

Introduction:

Non-specific low back pain (NSLBP) is a typical difficulty in the field of musculoskeletal healthcare, leading to the development of several disabilities.

A significant contributing element to the reversible mechanical alterations in lumbopelvic rhythm among the several components is tension in the hamstring muscles.

The present study aims to determine the best treatment approach for treating NSLBP to reduce disability and improve flexibility and range of motion by comparing the effectiveness of two manual therapy techniques: Central PA Glide with static Hamstring Stretch and SNAG with two leg rotation.

Methodology:

A Randomized Controlled Trial has been conducted at Central Referral Hospital at Physiotherapy OPD in Gangtok.

All patients with low back pain were referred from other departments and has been screened for non-specific low back pain according to eligibility criteria.

Random assigned to one of two groups has been enrolled through consecutive sampling techniques and randomization done by concealed envelope method. The study had a total sample size of 68 patients, of which 33 were assigned to Group A and 35 to Group B.

In total four weeks of the intervention period

Group-A received Central Postero Anterior Glide with Static Hamstring Stretch, and Lumbar Stabilization Exercise three times a week.

Group-B received Mulligan Sustained Natural Apophyseal Glides with Two Leg Rotation three times a week along with Lumbar Stabilization Exercise.

Results are measured using the Active Knee Extension for Hamstring muscle Flexibility, the Schober Test (Modified) for Lumbar Range of Motion, and the Oswestry Disability Index for Disability assessment.

Post-intervention evaluation is conducted from the first to fourth weeks of treatment.

ODI (for Disability) is followed up by telecommunication after two months.

Result:

Mulligan SNAG with Two Leg Rotation and Lumbar Stabilization exercise and Maitland Central PA glide with static hamstring stretch with Lumbar stabilization exercise have shown significant improvements in their respective groups.

In between group analysis Mulligan SNAG with Two Leg Rotation with Lumbar Stabilization exercises revealed a statistically significant change in Disability ($P<0.001$), Flexibility ($P<0.001$), and ROM for Flexion ($P<0.001$) and Extension($P<0.001$) in comparison to Maitland Central PA glide with static hamstring stretch with lumbar stabilization exercises group.

Follow-up for ODI after 2 months showed statically significant differences between the group analyses.

Conclusion: There is a significant difference in the improvement of outcomes related to NSLBP when Mulligan SNAGs and two-leg rotation with lumbar stabilization exercises has been applied as a treatment approach.

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INTRODUCTION

Low back pain with an unknown origin is referred to as nonspecific LBP. The back region does not exhibit a specific disease or anatomical or physiological alteration, but the discomfort continues. [1]

Low back pain that cannot be linked to a distinct, established pathology (such as a tumor, infection, osteoporosis, fracture, structural abnormality, radicular or cauda equina syndrome) is known as nonspecific low back pain (NSLBP).[2]

Non-specific LBP mainly occurs because of decreased strength in the back and core muscles or due to poor postural control. Muscle activation is reduced in such cases which leads to pain and restricted range of motion (ROM). As the ROM is restricted, activities of daily living also become difficult to perform leading to disability.[2]

NSLBP manifests as pain, tension in the back, and hamstring muscle tightness without any specific pathology, mostly including reduced range of motion, altered muscle function, reduced flexibility and proprioception deficits.[2]

Factor α (TNFα) in non-specific low back pain was suggested by findings from a prospective case control study in which, throughout 6 months of observation, the proportion of TNFα positive individuals was consistently and significantly higher in the nonspecific low back pain.[2]

There are several risk factors associated with non-specific low back pain including a poor posture, and psychological factors such as stress and anxiety. Additionally, certain occupational hazards, such as heavy lifting and repetitive movements, can also contribute to the development of non-specific low back pain. Understanding these risk factors is crucial in developing effective prevention and treatment strategies for this condition.[1]

Common evaluations for non-specific low back pain typically include assessing the patient's pain, range of motion, functional ability, and quality of life. Lumbar range of motion can be measured using methods like the Schober test. Functional disability could be assessed with questionnaires like the Oswestry Disability Index or the Roland-Morris Disability Questionnaire.[6]

Lumbar Central PA mobilizations have been suggested as a particular area to treat as part of a multifactorial approach to reduce spinal pain and restore mobility. Neurophysiological responses to mobilizations have been suggested to involve centrally-mediated processes. Research has focused on local muscle changes following PA mobilizations with Krekoukias et al. reporting reductions in the average EMG activity of the lumbar erector spinae which helps to improve mobility.[9]

Joint mobility is influenced by joint design and muscle stretchability. Reduced flexibility increases energy consumption and limits the effectiveness of teamwork. In tests, 90% of those with non-specific low back pain (NSLBP) reported having restricted motion, suggesting a higher degree of spinal mobility limitation. One method to increase lumbar mobility is spinal mobilization central posteroanterior pressure (PA), which also reduces non-specific low back pain (NSLBP) and muscle spasm. Central PA can cause improvement with trunk extensor muscle strength and lumbar mobility when used twice a week for four weeks. The study set out to investigate the immediate effects of central PA mobilization on lower back mobility, flexibility, trunk extensor strength, and lumbar extensor muscle strength after treatment sessions which has improved.[3]

Static stretching is effective in treating hamstring tightness, improving flexibility and muscular function as well as reducing discomfort in non-specific low back pain.13

The hamstring muscles may contribute to a patient's limited range of motion and impact how much they can elevate their leg or bend forward without experiencing pain in those with nonspecific low back pain. Since the hamstrings are involved in certain movement patterns that might exacerbate or accentuate NSLBP symptoms.7

One of the most crippling conditions that people suffer from poor hamstring flexibility. Elevated tautness in the hamstrings has been linked to non-specific lower back pain, a common issue that affects people of all ages. Depending on how tight the hamstrings are, dysfunctions might result. It can exacerbate discomfort and result in a dependence for it.[13]

Mulligan offers a way to alleviate limited joint range when the symptoms are brought on by activity. While the patient executes the problematic movement, the therapist assists with the proper accessory zygapophyseal joint glide.[16]

Full range of motion without discomfort must be achieved by the facilitatory glide. The physiological movement can be subjected to overpressure or prolonged end range holding. The therapist keeps the

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proper accessory glide while doing this previously symptomatic action Depending on the degree, irritation, and kind of disease, more repeats may be necessary.[16] SNAG can help a patient achieve functional movement patterns if they have excessive upper lumbar spine extension and lost lower lumbar spine segmental lordosis. Within the framework of their functional methods, patients must adjust their posture and maladaptive movement.[16]

To support this functional adjustment, physiotherapists can enhance proprioception through joint and muscle receptor input. In order to provide proprioceptive input for novel motions, an articular glide has been added to an active corrected movement pattern.[16]

TLR stretching involves gradually lengthening the muscle to the point of tolerance while maintaining the position at the longest length the muscle can tolerate, which is effective in improvement of flexibility in non-specific low back pain.[18]

This intervention may be the result of changes in the hamstrings' capacity to stretch, as well as changes in the muscle's compliance and viscosity (stiffness), which cause the hamstrings to lengthen. Elongation of the muscles, which freed the pelvis from its excessive posterior rotation, enhanced the biomechanical function of the spine and pelvis by enabling an effective lumbopelvic rhythm.[18]

Exercises for lumbar stabilization have been shown to successfully repair postural impairments, increase proprioception, reduce pain, and disability, and raise the stability index in NSLBP patients.[20]

Based on the motor learning method, Lumbar stability exercises (LSE) highlight the co- activation of the (LM) and transversus abdominis (TRA) muscles. These deep stabilizing muscles bind to the thoracolumbar fascia, increase intra-abdominal pressure to provide a stiffening effect in the lumbar spine, and stabilize the spine segmentally.[20]

LSE can improve muscle behavior, retrain the vital role of local trunk muscles for neuromuscular control of spinal stability, and reverse pain-related restructuring in the motor cortex. Exercises for lumbar stabilization have been shown to successfully repair postural impairments, increase proprioception, lower pain, discomfort and disability, and raise the stability index in NSLBP patients.[20]

LSE may help patients to recover from their neuromuscular dysfunction, improve the somatosensory processes that restore kinesthetic awareness, improve proprioception, and enable relearning of fine-tuned spinal control in patients with non-specific low back pain.[2]

METHODOLOGY

STUDY DESIGN

Experimental study

Sample size

68,34 patients in each group.

STUDY DURATION

1 year (June 2023 – May 2024)

Investigator: Student pursuing Master's in Physiotherapy in Orthopedic-Manual Therapy Primary Investigator: screened and gave intervention to both groups.

Secondary Investigator: Took the Outcome measures (Modified Schober Test, Active Knee Extension, and ODI) (MPT student).

OUTCOME MESURES

Goniometer

During active knee extension testing, the study assessed the accuracy of the universal goniometer and the electro-goniometer in detecting the Active knee extension angle of individuals who had recurrent non specific low back pain. Reliability test ratings above 0.7 indicated strong dependability in the results. It was discovered that universal goniometers were more appropriate for clinical evaluations (ICC value 0.80-0.70).[33]

Modified Modified Schobers Test

To measure flexion and extension range of motion, the sacrum should be marked when the person is standing at a midline point level with the posterior superior iliac spines. It is necessary to make a second mark 15 cm above the sacral mark After the range of flexion and extension, record the difference between the length measured after the motion[34] (ICC Value 0.98-0.95).[34,35]

Active Knee Extension

One technique for determining hamstring flexibility is the Active Knee Extension (AKE) test. With their hip and knee flexed at a 90-degree angle, the patient must first lie supine and actively extend their knee while keeping their hip posture. To assess hamstring

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flexibility, one uses a goniometer to measure the angle of active knee extension. According to a 2015 study, the active knee extension (AKE) test has excellent interrater reliability with the following ICC Values (ICC values: 0.87–0.94).[36]

Oswestry Disability Index

The Oswestry Disability Index (ODI) is a tool used to assess a patient's lower back pain and functional disability. It consists of ten sections, each evaluating physical function and daily living. The ODI categorizes patients into moderate, severe, crippled, bedridden, or exaggerated, and minor handicaps, using a severity scale of 0-5 ODI Reliability (ICC score of 0.90).[37]

OUTCOME MEASURES ASSESED

Figure 1. Photo of the Outcome Measures

PROCEDURE

Treatment in Group A

Group A

Central Postero Anterior Glide

participants in the research received Maitland mobilization on a hypomobile lumbar vertebra diagnosed by joint play by utilizing a central posteroanterior glide. With their hands by their sides and their head comfortably cocked to one side, the patient was in the prone position. Depending on the condition's severity and irritation, the therapist employed varying degrees. Three cycles of 60 seconds each, spaced one minute apart, were administered at the hypomobile intervertebral level as part of the therapy. Grade 2 and Grade 3 oscillations were utilized in the first sessions to reduce discomfort and irritation and to increase the range of motion, respectively.

Static Hamstring Stretching- A patient in a supine lying position immobilized one limb and A static hamstring stretch performed by a physiotherapist passively involves the physiotherapist moving the patient's leg into a stretch position without the patient actively using their muscles. Here's a step-by-step guide to how it might be done.

The patient lies on their back on a comfortable, flat surface such as a treatment table. The physiotherapist stands beside the patient, focusing on the leg to be stretched. The physiotherapist gently lifts the patient's leg while keeping the knee straight. The other leg remains flat on the table to stabilize the pelvis.The physiotherapist slowly raises the patient's leg, maintaining the knee in full extension. This should be done in a controlled manner to avoid any sudden movements that could cause discomfort or injury.The leg is lifted until a gentle stretch is felt in the hamstrings. The patient should feel a pull along the back of the thigh but no pain.

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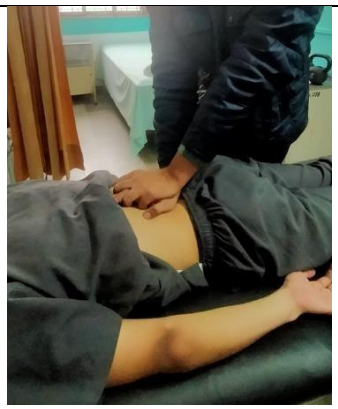
Hold the Stretch: Once the optimal stretch position was reached, the physiotherapist holds the leg in that position for a specified period, typically between 30 to 40 seconds. During this time, the patient should remain relaxed and breathe normally.

Repetition: The stretch can be repeated several times, with a brief 10 sec rest period between each repetition.

Treatment Interventions in Group A
Central Postero Anterior Glide and Static Hamstring Stretch



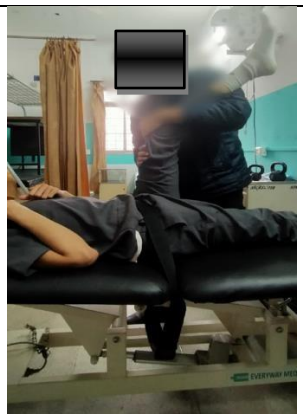


Figure:2 Central Postero Anterior Glide with Static Hamstring Stretch

Treatment Procedure in Group B

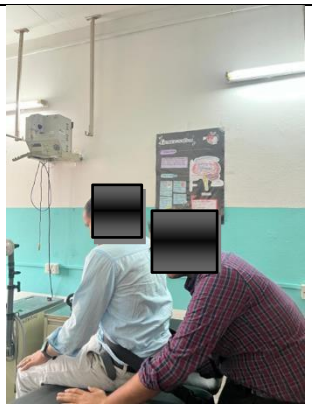
Apophyseal Glides in Mulligan Sustained Natural Using the movement examination results for a limited lumbar range of motion and discomfort reaction, the flexion or extension glide application was selected. When the patient was seated, the SNAGs were applied while their pelvis was stabilized at the anterior superior iliac spine level (ASIS) with a Mulligan belt.The spinous processes of the affected segment's superior and inferior vertebras were glided over with the ulnar aspect of the therapist's hand for flexion and extension, respectively.When the patient's previous movement was uncomfortable or restricted, a passive auxiliary glide was applied and kept up until the patient completed a full movement arc.Since Mulligan has previously said that the glide was applied over the spinous process, the patient was comfortable while the force's amplitude was maintained.

Mulligan Two Leg Rotation

A therapist uses the opposite hand to grab the side of the subject's restricted hamstring flexibility while standing on a platform. With feet off the plinth, both legs are flexed. The therapist applies excessive pressure for 30 seconds while gradually moving the patient's legs to the side of their restricted hamstring muscle flexibility. After that, the individual is lowered to the plinth and stretched three to five times, resting for one minute in between.

Treatment Interventions in Group B

Mulligan Sustained Natural Apophyseal Glides and Two Leg Rotation



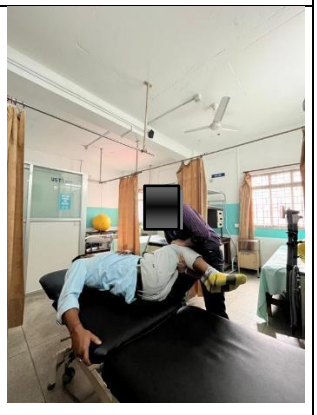


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Figure:3 Mulligan SNAGs with Two Leg Rotation

Procedure of Lumbar Stabilization Exercise

Week one- Isolated transversus abdominis and lumbar multifidus training.

1. Transversus Abdominis

In prone lying position on a couch with a small pillow placed beneath their ankles. Participants are asked to gently draw in the lower anterior abdominal wall with normal breathing control, no movement of the spine and pelvis.

2. Lumbar Multifidus

Sit on the chair and Lumbar Multifidus activation will be stimulated by raising the contralateral arm while performing gentle draw of anterior abdominal wall.

Week two- Co-contraction of transversus abdominis and lumbar multifidus. In the sitting position

1. Perform co-contraction of TrA and LM in the sitting position on a chair. Use the index and middle fingers to palpate contraction of transversus abdominis muscle and the two fingers of the opposite hand to palpate contraction of lumbar multifidus muscle.
2. Train forward and backward trunk movements keeping the lumbar spine and pelvis in a neutral position.

In the lying position

Perform contraction of the two muscles in a crook lying position with both hips at 45 degrees and both knees at 90 degrees.

1. Abduct one leg to 45 degrees.
2. Slide a single leg down until the knee is straight.

Week three- Co-contraction of transversus abdominis and lumbar multifidus. In the sitting position

Train both of the two muscles while sitting on a balance board.

Forward, backward and sideways movements of the trunk while keeping spine in a neutral position.

In the lying position

Performing stabilization of the two muscles in the crook lying position.

1. Raise the buttocks off the bed.
2. Repeat above exercise with one leg crossed over the supporting leg.

Week four- Co-contraction of transversus abdominis and lumbar multifidus. In Quadruped position

Similar contraction of the two muscles is performed in a four-point kneeling position, keeping the back in a neutral position.

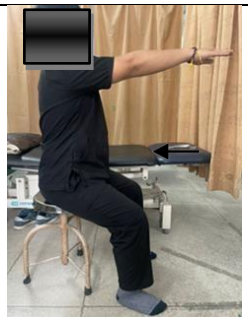
1. Raising a single leg.
2. Raising an arm and opposite leg.

In standing position

Equal contraction of the two muscles in a standing position.

1. Flex the hip and knee of one leg to 90 degrees while co-contracting muscles with a ball behind the back.
2. Perform ankle movement in a forward-backward direction, with both feet on floor.

Lumbar Stabilization Exercise (Week One)



Lumbar Stabilization Exercise (Week Two)

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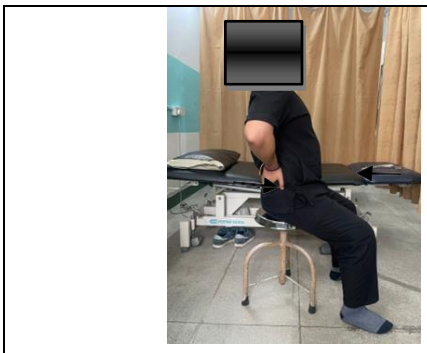
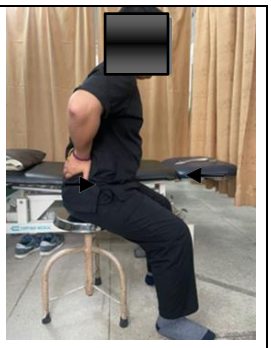
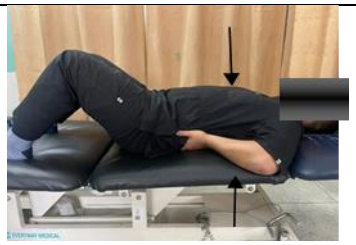
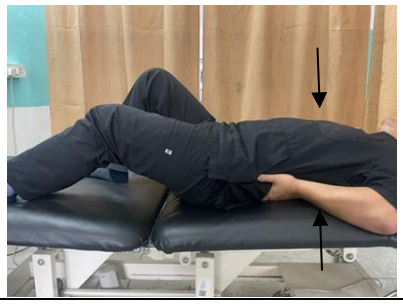
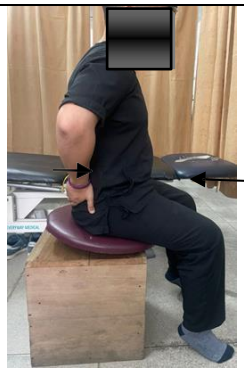
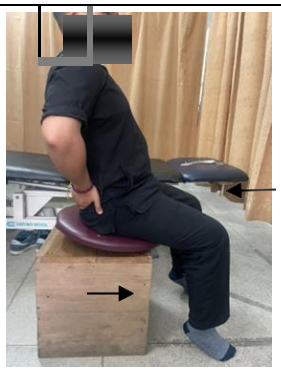
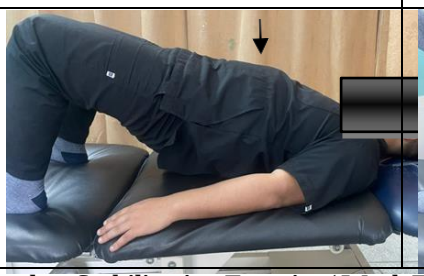
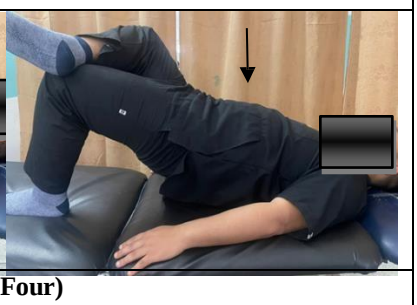





Lumbar Stabilization Exercise (Week Three)

Lumbar Stabilization Exercise (Week Four)

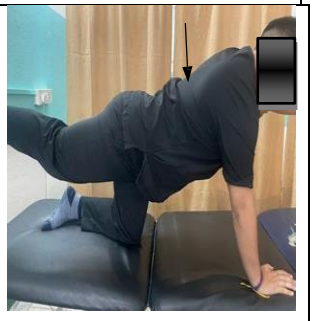



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Figure 4: Lumbar Stabilization Exercises

RESULT

The consort diagram in Figure 5 shows the flow of the participants in the study in which 80 participants were identified. Out of these total 80 participants according to inclusion and exclusion criteria, 70 participants have been included. Out of the 70 participants 2 participants dropped out and statistical analysis was done with a total of 68 participants.

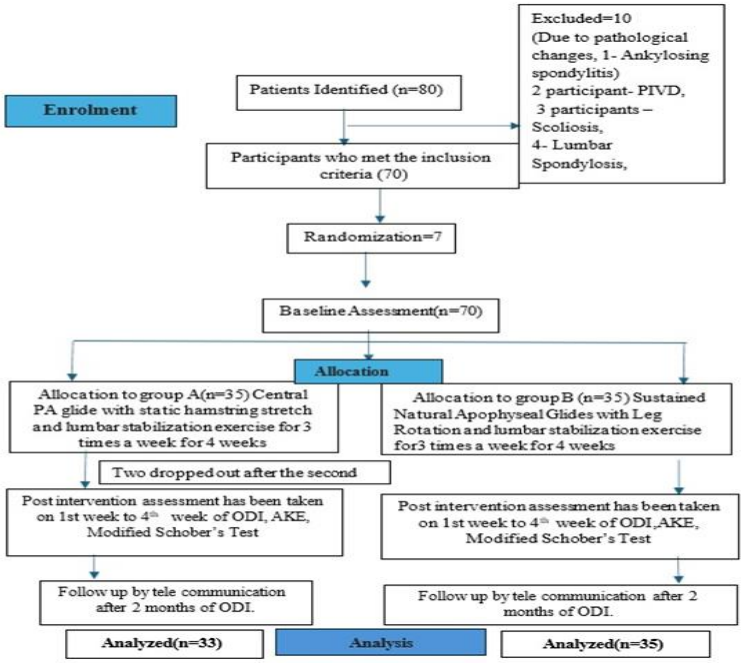

Figure 5 - Flow of the participants through the study

Comparison Within the Group

The information of within group analysis where there was improvement in both groups in range of motion, hamstring flexibility, and reduction of disability as the treatment goes on. The data were compared within groups in different treatment times where there is an increase in mean values of lumbar range of motion, and a decrease in mean values active knee extension, oswestry disability index as the treatment progresses. In both groups mean value lies within the confidence level which suggests that the value is statistically significant.

The below Table 1 is explaining how range of motion is improving with improvement in hamstring muscle flexibility and significant improvements in functional ability via reduction in disability in oswestry disability index with the progression of intervention from first week to fourth week.

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Table 1: Summary of group by time data for outcome measures at baseline, 1st to 4th week of intervention

Outcome measure	Group	Time	Mean ± SD	95% Confidence Interval
Oswestry Disability Index	Group B	Baseline	60.25±2.41	59.44-61.06
		1st week	44.37±4.24	42.95-45.78
		2nd week	38.14±4.94	36.51-39.77
		3rd week	30.11±4.91	28.40-31.82
		4th week	23.20±3.52	21.68-24.72
		Follow Up	28.14±4.51	29.70-26.58
	Group A	Baseline	58.70 ± 2.39	57.86-59.53
		1st week	51.72±4.14	50.27-53.18
		2nd week	47.45 ±4.71	45.77-49.13
		3rd week	43.06 ±5.20	41.30-44.81
		4th week	37.90 ± 5.35	36.34-39.47
		Follow Up	47.60±4.72	49.21-46.00
Active Knee Extension	Group B	Baseline	40.91 ± 0.35	40.22-41.60
		1st week	35.68 ± 0.42	34.83-36.53
		2nd week	30.71±0.53	29.65-31.77
		3rd week	25.28±0.57	24.13-26.43
		4th week	19.91±0.46	18.98-20.84
		Baseline	41.12 ± 1.81	40.41-41.82
		1st week	37.42±0.43	36.54-38.30

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	Group A	**2nd week**	34.15±0.54	33.05-35.24
		3rd week	30.07±0.59	28.89-31.25
		4th week	25.72±3.83	24.77-26.68
Modified Modified Schobers Test Flexion	**Group B**	**Baseline**	2.53±0.65	2.32-2.74
		1st week	3.37±0.58	3.17-3.58
		2nd week	4.16±0.84	3.90-4.42
		3rd week	4.84±0.78	4.59-5.09
		4th week	5.60±0.85	5.35-5.85
	Group A	**Baseline**	2.50±0.65	2.29-2.72
		1st week	2.83±0.59	2.62-3.03
		2nd week	3.22±0.65	2.95-3.48
		3rd week	3.53±0.66	3.27-3.78
		4th week	4.00±0.60	3.74-4.26
Modified Modified SchobersTest Extension	**Group B**	**Baseline**	2.66±0.66	2.44-2.87
		1st week	4.00±0.70	3.78-4.21
		2nd week	5.10±0.87	4.85-5.34
		3rd week	5.94±0.95	5.68-6.20
		4th week	6.88±1.03	6.60-7.15
	Group A	**Baseline**	2.75±0.59	2.53-2.97
		1st week	3.20±0.53	2.98-3.42
		2nd week	3.62±0.53	3.37-3.88
		3rd week	4.03±0.50	3.76-4.30
		4th week	4.69±0.53	4.40-4.98

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Table 1. The data were compared within groups in different treatment time where there is increase in mean values of range of motion (Modified Modied Schobers Test), flexibility (Active Knee Extension) and reduction of disability (Oswestry Disability Index) as the treatment progresses. In both groups mean value lies within the confidence level which suggests that the value is significant.

Table 2: Summary table of effects in outcome measures

Measures	At the end of 4th week of intervention and Follow Up		Analysis	Effect	P
	Group A (N=33)	Group B (N=35)			
ODI(%)	37.90 ±5.35	23.20±3.52	GLM-RM ANOVA	Group x time	**< 0.01***
ODI Follow-Up (%)	47.61±4.72	28.14±4.51	GLM-RM ANOVA	Group x time	**< 0.01***
AKE (Degree)	25.72±3.83	19.91±0.46	GLM- RM ANOVA	Group x time	**< 0.01***
Modified Modified Schobers Test Flexion (cm)	4.00±0.60	5.60±0.85	GLM-RM ANOVA	Group x time	**< 0.01***
Modified Modified Schobers TestExtension (cm)	4.69±0.53	6.88±1.03	GLM-RM ANOVA	Group x time	**< 0.01***

Table 2. Between group analysis done showed there was statistically significant improvement in Mulligan SNAG with TLR as compared to Central PA glide with static hamstring stretch on ODI, Active Knee Extension and Modified Modified Schober Test in subjects with Non-Specific Low Back Pain.

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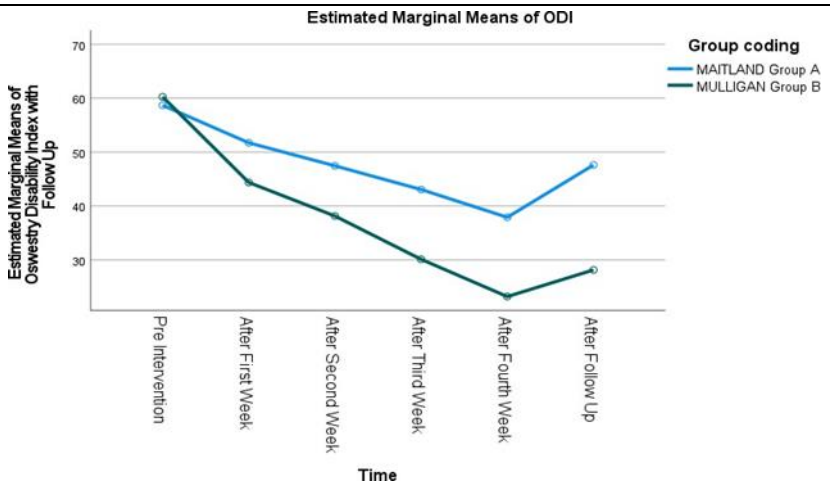

Figure 6 : Time vs estimated marginal means of Disability from Oswestry Disability Index shows improvement in Quality of Life in both the groups, but more improvement seen in the Mulligan group which is statistically significant.

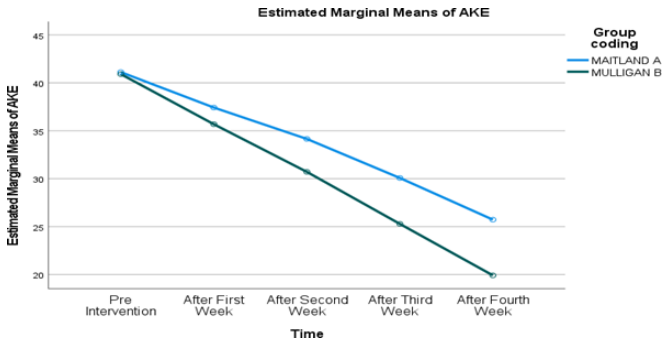

Figure 7 : Time vs estimated marginal means of Hamstring Flexibity from Active Knee Extension (AKE) shows improvement in Hamstring Flexibity in both the groups, but more improvement can be seen in the Mulligan group which is statistically significant.

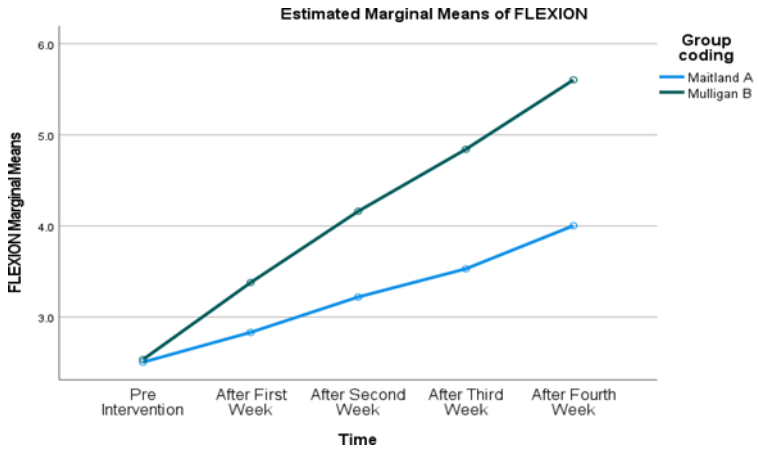

Figure 8 : Time vs estimated marginal means of Lumbar Flexion Range of Motion from Modified Modified Schobers Test shows improvement in Range of Motion in both the groups, but more improvement is seen in the Mulligan group which is statistically significant.

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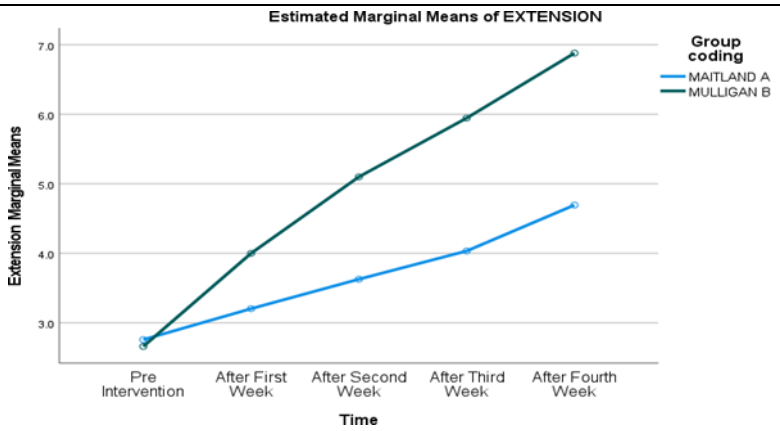

Figure 9 :Time vs estimated marginal means of Lumbar Extension from Modified Modified Schobers Test shows improvement in Range of Motion in both the groups, but more statistical significant improvement seen in the Mulligan group.

DISCUSSION

The objective of the study was to compare the effectiveness of central Postero anterior glide with static hamstring stretch and Sustained Natural Apophyseal Glides with Two Leg Rotation on range of motion, flexibility, and disability in Non Specific Low Back Pain. Although Both interventions are effective in the improvement of range of motion, active knee extension, and reduction of disability. However, four weeks of intervention of Mulligan SNAG with Two Leg Rotation is more effective in comparison to Central PA glide with static hamstring stretch in subjects with Non Specific Low Back Pain. As the therapy progressed, the mean values of the lumbar range of motion, active knee extension, and oswestry disability index showed improvement. The results showed there was a statistically significant difference between the groups.

Range of Motion

The present study showed both treatment techniques are effective in patients with non specific low back pain but Mulligan SNAG with Two Leg Rotation is more effective and statistically significant in comparison to Central PA glide with static hamstring stretch in improving range of motion of subjects with NSLBP, which is similar to earlier studies done by Simsek S et al.2019 where Mulligan's mobilization was more effective in increasing range of motion. Mulligan's repeated mobilizations can increase the range of motion by dispersing synovial fluid over the joint disc and cartilage, which reduces friction during motion. After three weeks of lumbar SNAG range of motion, functional ability improved, and these improvements persisted until the mid-term, according to this study.[17]

A study done by Benjamin Hidalgo et al. 2015 showed that in individuals with nonspecific low back pain, lumbar spine SNAG improved the kinetic algorithm of spinal dysfunction and range of motion.[26] By Dynamic trunk movement with cranially directed glide along facet joint plane, and rectification of positioning errors may amplify biomechanical effects of lumbar SNAG.[26]

In 2017, Hisham Mohamed Hussien et al. reported that when SNAG is a effective program for treating chronic nonspecific LBP, it helps to reduce joint repositioning error, pain, and functional impairment and ultimately improves range of motion.[41]

In addition, mobilizing the affected spinal joints with sustained glide may help to relieve pressure on the capsule and enhance joint mobility. Successful repetition of flexion and extension movement results in habituation and extinction of the aversive memory (painful trunk flexion or extension). Range of motion and muscular endurance were improved with a therapy regimen that included mulligan SNAG and stabilization exercises with NSCLBP, according to Mohan Kumar G et al. in 2020.[42]

With mulligan technique patients get proprioceptor stimulation of muscle spindles, or GTO, in muscles more effectively, SNAG combines functional active movements with accessory glide movements, i.e., passive movements administered by physiotherapists.The ability to reactivate the core muscles improves and lessens lower back muscle compensation.[43]

Mulligan mobilization enhances muscle spindle sensitivity and facilitates mechanoreceptor facilitation in muscle gamma motor neurons. Increased tissue stretch

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around the spine triggers more mechanoreceptors, improving position sensing accuracy near end-ROM, thereby improving range of motion.[16]

Ji Hoon Lee et al., 2019 did a study where they found TLR advised as an intervention effective in improving hamsting flexibility. [29] Mulligan Two Leg Rotation (TLR) is a pain-free technique that improves hamstring flexibility by combining passive mobilization with patient movement. It reduces tension and increases range of motion by addressing joint alignment and muscle tightness. TLR can improve mobility, reduce discomfort, and minimize sensory pain stimulation. It is particularly beneficial for patients with acute or chronic non specific low back problems, as it enhances biomechanical performance and flexibility.[29]

Disability

The present study showed both treatment techniques are effective in patients with non specific low back pain, but Mulligan SNAG with Two Leg Rotation is more effective in comparison to Central PA glide with static hamstring stretch in reduction of disability in NSLBP which is statistically significant.

The present study result is in association with the previous study done by Putu Yudi Pramana Putra et al. which found that Mulligan's Sutained Natural Apophyseal Glides (SNAG) combined with conventional physiotherapy measures are more effective in improving the quality of life in NSLBP patients than the conventional stretching interventions.[28]

Mulligan's Sustained Natural Apophyseal Glide (SNAG) addresses non-specific low back pain, providing relief from discomfort due to disability, improved spinal function, joint mobility restoration, and promoting sustained mobility and improved quality of life by addressing mechanical and neurophysiological alteration in lumbar spine.[28]

Mulligan technique can reduce disability in non-specific low back pain patients by addressing spinal positioning errors, restoring normal function, and resolving muscle guarding around the spine, resulting in specific neurophysiological and biomechanical changes of alignment in non specific low back pain. [40]

In non-specific low back pain (NSLBP), another study done by Vignesh Bhat P et.al evaluated the benefits of Myofascial Release (MFR) versus Mulligan Sustained Natural Apophyseal Glide (SNAG) on, disability, functional capacity, and lumbar range of motion. The present study is similar to this study where SNAG decreased disability by correcting positional fault and by stimulating the mechanoreceptors at the joints and Golgi tendon organs in the muscles.[27]

Heggannavar et al. found that the SNAG technique improved the ODI score by correcting the facet joint positional fault, allowing patients to move freely in flexion and extension and increase mobility. Painless movement increased self-confidence and reduced psychological fear and depression in patients with NSLBP after positional fault reduction.[46]

A 2014 study by Pratik A. Phansopkar, Vijay Kage, et al. found that TLR technique can alleviate disability in individuals with non-specific low back pain (NSLBP) by enhancing hamstring flexibility. The technique involves alternating passive and dynamic motions to improve joint alignment and hamstring flexibility. This approach is particularly beneficial for patients with acute or chronic NSLBP, as it enhances biomechanical alignment, reduces discomfort, and increases hamstring muscle flexibility. [18]

Hamstring Muscle Flexibility

The present study showed both treatment techniques are effective in patients with non specific low back pain but Mulligan SNAG with Two Leg Rotation is more effective and statistically significant in comparison to Central PA glide with static hamstring stretch for improvement of hamstring flexibility which is similar to study done by Ji Hoon Lee et al., 2019 and Pratik A. Phansopkar, Vijay Kage, et al., 2014 in patients with NSLBP. That showed Mulligan Two Leg Rotation (TLR) technique is designed to improve hamstring flexibility through a pain-free approach that combines passive mobilization with patient movement. The technique involves the therapist guiding the patient's legs in a rotational movement while maintaining a specific posture. This helps in reducing tension and increasing the range of motion in the hamstrings by addressing joint alignment and muscle tightness. [29,18]

A 2019 study by Ji Hoon Lee et al. recommends the TLR method as an intervention for lumbopelvic rhythm stabilization, reducing hamstring muscle stiffness, and reducing discomfort and minimizing burden to sensory pain receptors in non specific low back pain.[29]

A 2014 study done by Pratik A. Phansopkar, Vijay Kage, et al. found that Two Leg Rotation (TLR) can alleviate soreness, improve range of motion, and reduce disability in individuals with ANSLBP by enhancing hamstring

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flexibility. TLR involves combining passive and dynamic motions to ease tense muscles and enhance joint alignment. TLR technique enhances hamstring flexibility, improving biomechanical performance and lumbar range of motion. It corrects excessive posterior rotation, improving flexibility, and contributing to better mobility and function in daily life activities for patients with chronic or acute non specific low back issues.[18]

A study done by Laxmi R. et al. 2016 to evaluate effectiveness of Two Leg Rotation for treating acute nonspecific low back pain showed statistical significance in all parameters, and the study concluded that Mulligan's TLR procedures can increase hamstring flexibility. TLR stretching improves muscle length, joint alignment, and hamstring flexibility, especially for non-specific low back pain patients by reducing muscular tension and improves daily life mobility. [30]

CONCLUSION

Both interventions are effective in the improvement of range of motion, active knee extension and reduction of disability. However, Four weeks of intervention of Mulligan SNAG with Two Leg Rotation is more effective in comparison to Central PA glide with static hamstring stretch in subjects with Nonspecific Low Back Pain.

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