International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Hip Flexion Angle Measurements During Straight Leg Raise with the Addition of Cervical and Lower Extremity Sensitizing Maneuvers

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Abstract

The aim of this paper is to determine the effects of neural tension producing movement of cervical spine and lower extremity on hip flexion ROM during SLR test. Subjects were tested during SLR testing with the addition of Sensitizing Maneuvers, where the cervical spine and Ankle divided into cervical, Ankle, Hip in neutral position and in Flexion and Hip Medial Rotation and then with the combined movements of all three positions using Universal Goniometer.

There was decreases in Hip Flexion ROM with the addition of Sensitizing Maneuvers and with all sensitizing added together.

Keywords: Neurodynamic Testing, Structural Differentiation, Straight- Leg Raising..

I. INTRODUCTION(10 Bold)

Neurodynamic tests are used to assess the nervous systems mechanosensitivity through monitoring the response to movements that are known to alter mechanical stresses acting on the nervous system. Mechanosensitivity is one of the aspect of standard neurological examination involves assessing the sensitivity of peripheral nerves to limb movement. The most common lower quarter neurodynamic test is the straight leg raise test which referred to the pain coming from compression of the sciatic nerve by hamstrings. SLR is great value in assessing normality of the roots of the sciatic nerve and tightness of the hamstring muscle.

SLR test has been described as a passive test that is done with the neck in neutral and the opposite hip extended. The Basic SLR test consist of the tester performing passive hip flexion with the patient in supine position and knee held in full extension. When tension is applied to the nerves, the intraneural pressure will increase as the cross sectional area decreases. The value of SLR test can be determined with a goniometer. The proposed interpretations of the neurodynamic of a positive test include considerations for weather the test reproduces the patients symptoms, identifies asymmetry between limbs or significant deviation from the norm, induces changes in symptoms by distant movement. The source of limitations of movement is known as Structural Differentiation which applied during neurodynamic testing in order to emphasize the role of neural tissue in creating a change in the test outcome. Flexion of Cervical Spine, Dorsi flexion of Ankle, Medial Rotation of the Hip are the examples of maneuvers. It provides a quick and informative indication of potential components involved.

Objectives of the Study:-

1. To examine the effect of neural tension producing movement on Hip flexion ROM with the addition of cervical flexion, Ankle Dorsiflexion, Hip Medial Rotation.
2. To examine the effect of neural tension producing movement on Hip Flexion with the addition of combined all movements.

HYPOTHESIS:-

Null Hypothesis- there will not be any significant reduction of hip flexion angle during SLR with the addition of sensitizing manuvers.

Experimental Hypothesis- there will be significant reduction of hip flexion angle with the addition of sensitizing maneuvers.

Review Of Literature:-

Studies on SLR- This study found out the mechanosensitivity of lower extremity during Straight leg raising test with no low back pain. Hip flexion angle and surface electromyographic measures were taken and compared during SLR performed with ankle dorsi-flexion and found reduction in Hip Flexion reduced during DF-SLR. Distal muscle activation reduces hip flexion motion. The sensitivity of supine was compared with sensitivity of seated SLR and found SLR test performed in supine position is more sensitive in reproducing leg pain than the seated SLR.

Studies on SLR and Slump Test-

Study was done to determine agreement and correlation between the SLR and Slump test presenting with back and leg pain by using inclinometer to measure range of motion. The SLR and Slump test were performed on each side. Reproduction of presenting symptoms, which were intensified by ankle dorsiflexion, was interpreted as a positive test. Results showed that ROM of both the tests was significantly reduced compared to ROM on the contralateral side and who had negative results. This study has compared between the sensitivity and specificity of slump test with the SLR. Both SLR and Slump test were performed on all patients found that Slump test was more sensitive than SLR test. The study was done to assess the effect of structural differentiation or sensitizing maneuvers to standard neurodynamic tests of SLR and Slump test on knee Extension ROM.

Studies on Goniometry-

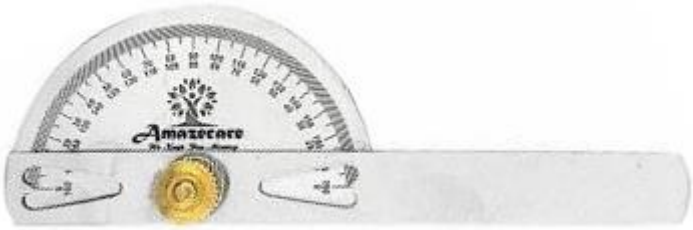
This study was done to examine interrater for inclinometer and goniometric measurements of hip extension flexibility with the modified Thomas test. This study has undertaken to examine the intratester and intertester reliability and validity of universal goniometer for Active knee flexion. The study was undertaken to investigate the reliability of goniometer in the measurement of ankle dorsiflexion where a standardized ankle position was used to measure full range of ankle dorsi-flexion. The study has been done to determine the reliability of the goniometer for assessing active lower extremity joint ROM.

Methodology:

- Source of Data- Padmashree clinic of Physiotherapy, Nagarbhavi, Bangalore.
- Method of Collection of Data- subjects with no history of low back pain, Simple Random Sampling, 80 subjects, Cross- Sectional Study Design.
- Inclusion Criteria
  Age between 20- 40 years

Subjects were required to exhibit a SLR of at least 70 degrees, subjects with normal muscle strength and range of motion of the back and lower extremities.

- Exclusion Criteria-
  Subjects with history of low back pain Any lower limb muscular or joint injury Neurological or vascular impairment
- Materials used- Universal Goniometer



Procedure-

Subjects who fulfill the inclusion and exclusion criteria will be included in the study and a written/informed consent will be taken from them. SLR elevation was measured in supine by flexing the hip to the limit of motion while maintaining knee extension. All pretesting measurements of SLR were taken with the patient in a supine position with the lower extremity in neutral hip rotation and with neck and ankle in neutral position. After that, sensitizing maneuvers like neck flexion, Ankle Dorsi-flexion, Hip medial rotation were added during SLR and measurements were taken.

The experimental conditions are divided into two parts as for e.g. neck was in neutral for condition 1 and neck was flexed for condition 1a.

Condition 1 and 1a:-

Condition 1 - The subject was lying in supine on the treatment couch with the trunk, shoulders and hips in a neutral position with the head kept flat. The researcher placed goniometer with the stationary arm aligned between the greater trochanter and the midline of the trunk and moving arm aligned between the greater trochanter and lateral condyle of the femur. Goniometric measurement was recorded as zero.

Then the subject was asked to keep the neck in neutral position. The leg was then passively elevated by researcher's assistant in sagittal plane until the onset of resistance or subject is feeling stretch sensation in the posterior thigh area. The researcher using a universal goniometer measured hip flexion angle ROM for condition 1.

Condition 1a- with the all procedures same as condition 1, then the subject was asked to fully flex his head and neck, approximating the chin to the sternum. While maintaining this position, researcher's assistant then slowly elevated the subject's leg while maintaining full knee extension. The hip flexion angle ROM was measured by researcher for condition 1a.

Condition 2 and 2a:

Condition 2- The subject was lying in supine on the treatment couch with the trunk, shoulders, and hips in neutral position with the head kept flat. Then the subject was asked to keep his ankle in neutral position. The researcher's assistant then slowly elevated the leg to the onset of resistance. The researcher then measure the hip flexion angle ROM for condition2.

Condition 2a- after asking the subject to relax, the researcher's assistant placed one hand above the subjects patella while the other hand dorsiflexed the subjects ankle to end of range by applying pressure

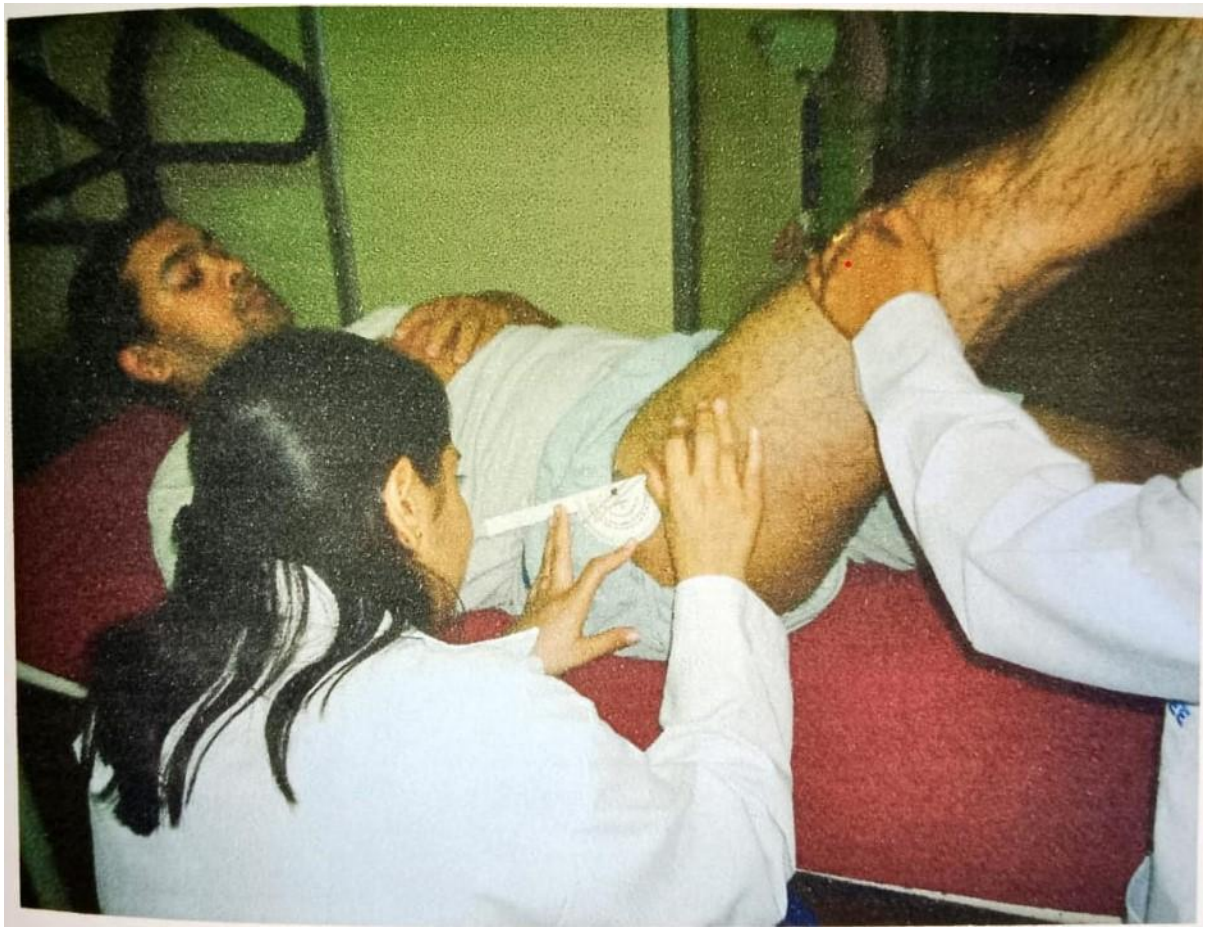
against the plantar aspect of the foot at the metatarsal heads. While maintaining this position, researcher's assistant then slowly elevated the subject's leg till the onset of resistance. The hip flexion angle ROM was measured then.

Condition 3 and 3a- with the same SLR position as before, the subject was asked to keep his hip in neutral rotation. The researcher's assistant then slowly elevated the subject's leg till the onset of resistance or subject is feeling stretch sensation in posterior thigh area. Hip flexion angle ROM was measured.

Condition 3a- researcher's assistant placed one hand above the subject's patella while the other hand medially rotated the subjects hip to the end rage. Then elevated the subject's leg till the onset of resistance. Hip flexion angle ROM then measured.

Condition 4 and 4a-with the same SLR position the subject was asked to keep his head, ankle and hip in neutral position. Then slowly elevated subject's leg till the onset of resistance .then the researcher measured hip flexion angle ROM for condition 4.

Condition 4a- the researcher's assistant placed one hand above the subjects patella while the other hand dorsiflexed the ankle along with the medially rotated the subject was then asked to fully flex the head and neck, the researcher's assistant then slowly elevated subjects leg till onset of resistance and angle was measured.



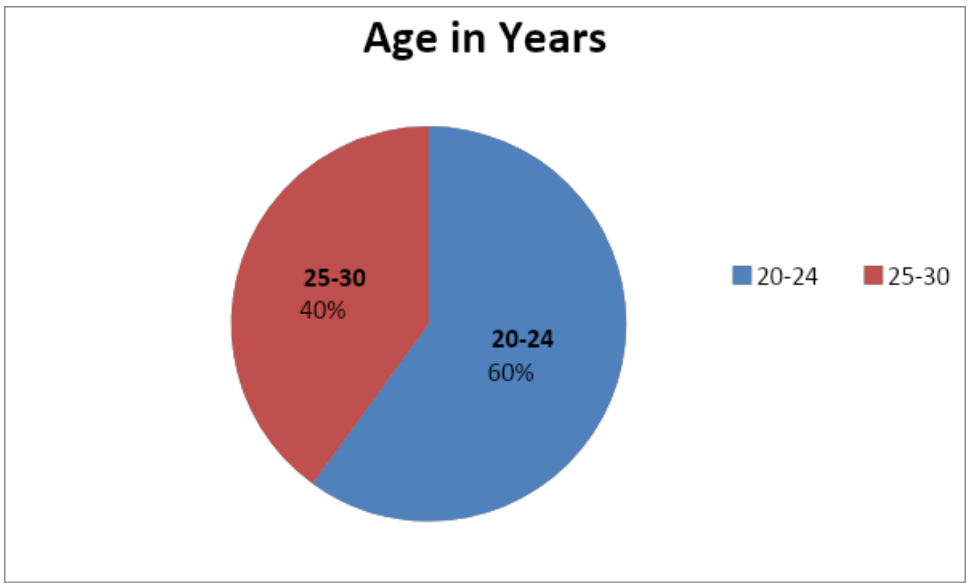
Results:

A cross- sectional study with the total number of subjects consisted of random samples of 16 males and 64 females to study any significant reduction in hip flexion angle during SLR with the addition of sensitizing maneuvers.

Before the addition of sensitizing maneuvers Hip flexion angle was measured as a measure for comparison. These angles were measured again after the addition of sensitizing maneuvers. Descriptive statistical analysis was made using SPSS statistical software. Results showed there was significant reduction in Hip flexion angle during SLR with the addition of sensitizing maneuvers and more reduction in angle after the addition of all sensitizing maneuvers together.

Age distribution of subjects studied:

Age in years	**Number**	**%**
20-24	48	60
25-30	32	40
Total	**80**	**100**

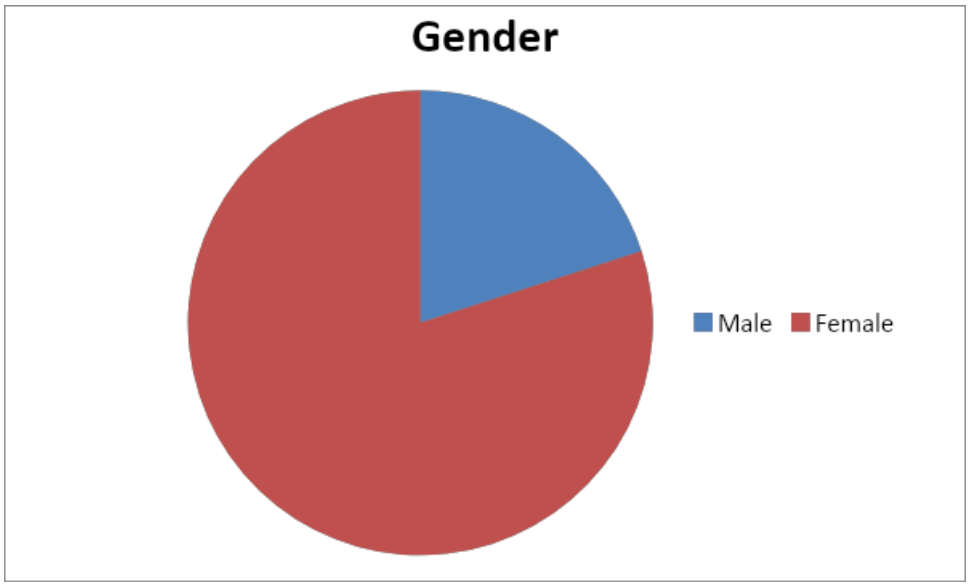


As given in the tables there were 48 subjects in Age group 20-24 years and 32 subjects in Age group 25-30 years

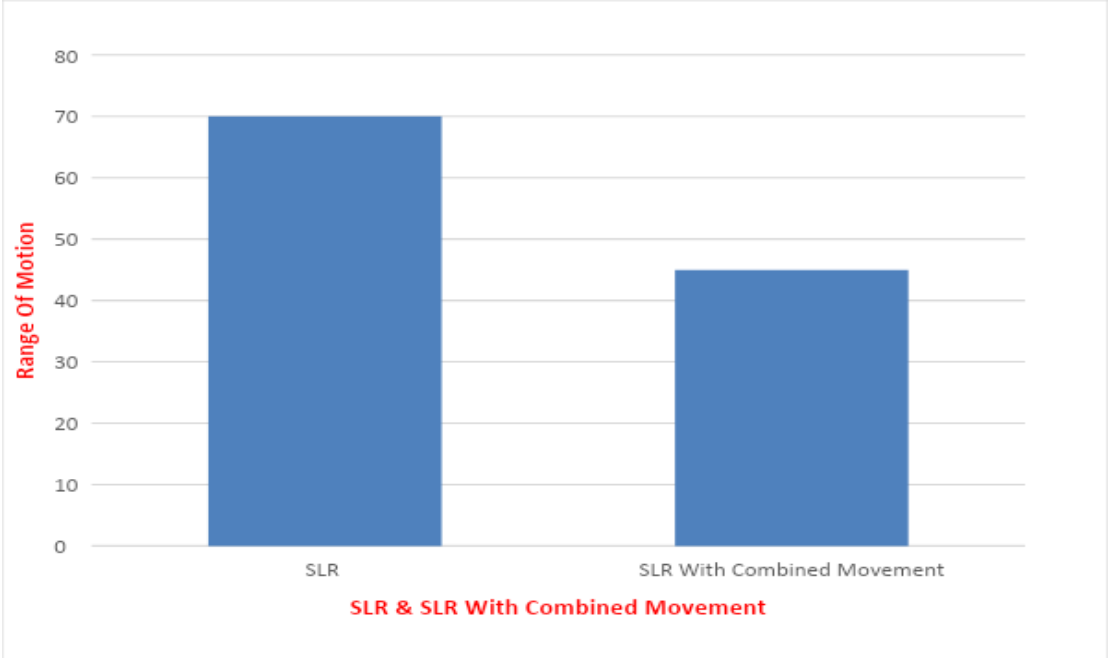
Gender Distribution

Gender	Number	%
Male	16	20
Female	64	80
Total	**80**	**100**

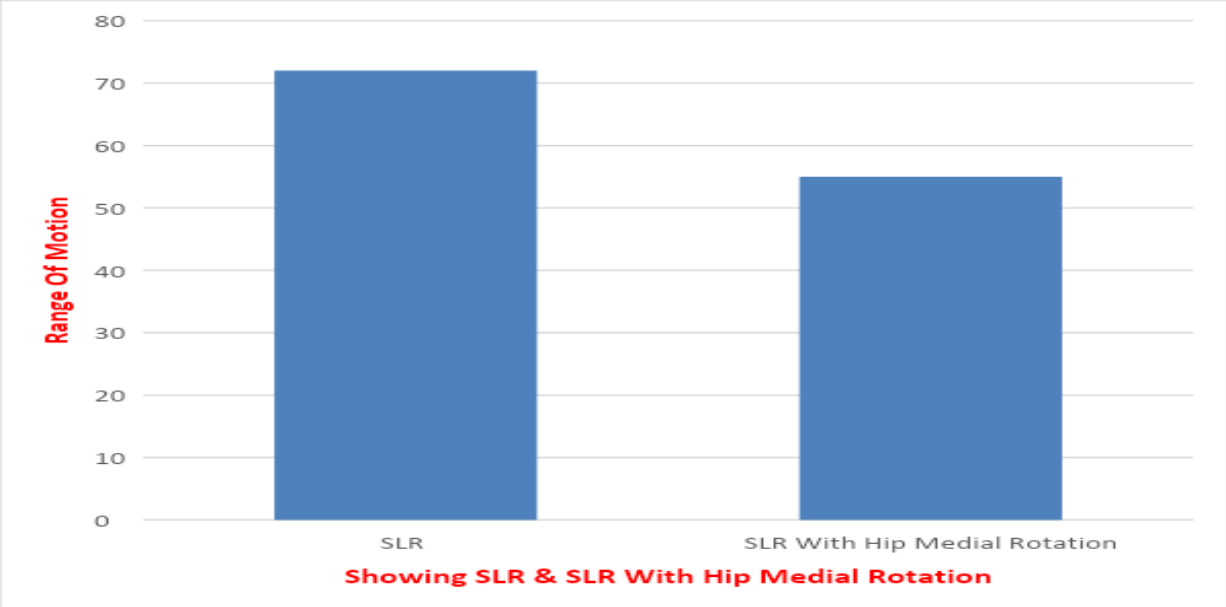
There were 16 males and 64 females in the total 80 subjects.



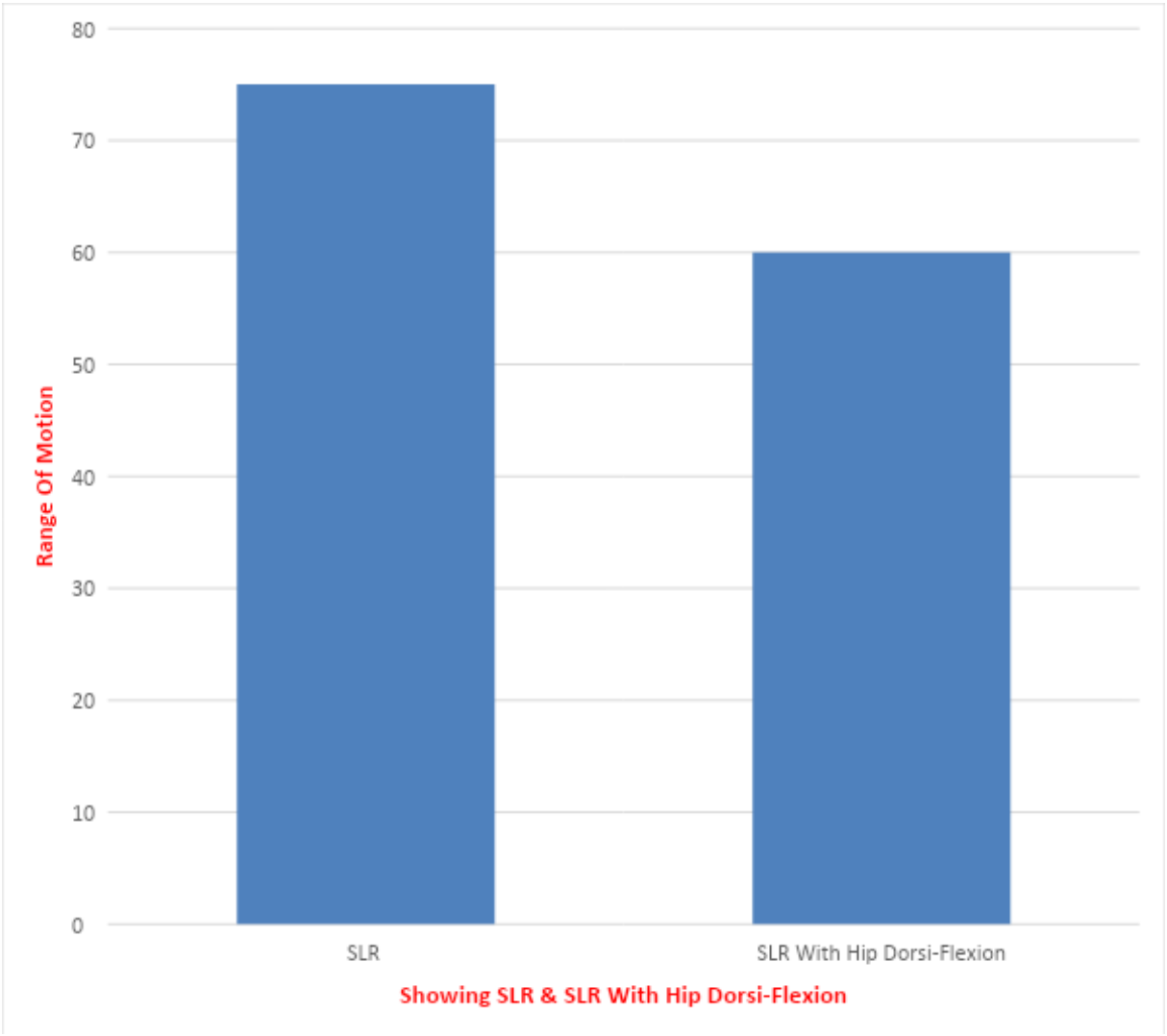
	SLR	SLR With Combined Movement
Range Of Motion	70	45



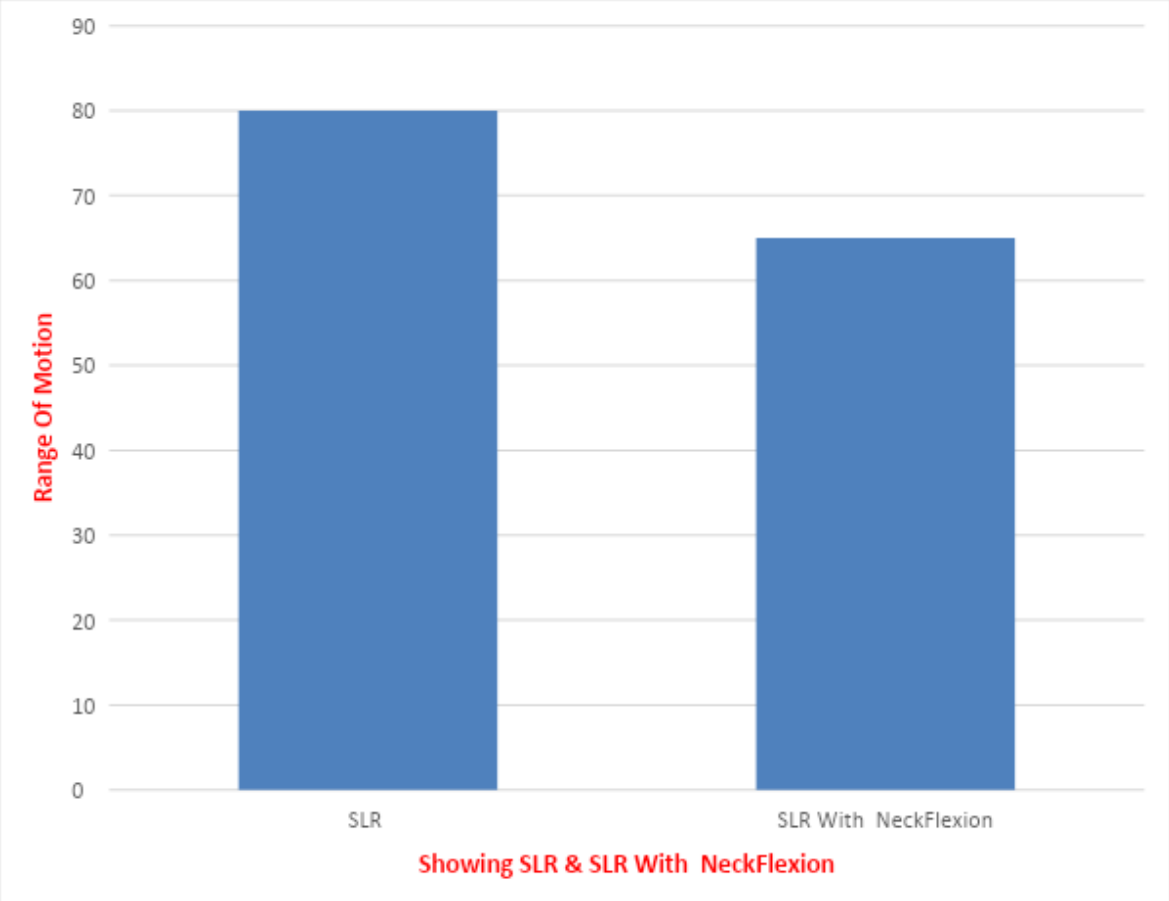
	SLR	SLR With Hip Medial Rotation
Range Of Motion	72	55



	SLR	SLR With Hip Dorsi-Flexion
Range Of Motion	75	60



	SLR	SLR With Neckflexion
Range Of Motion	80	65



Discussion:

The purpose of the present study was to evaluate the responses to the SLR test with the addition of sensitizing movements of cervical spine flexion, Ankle Dorsi flexion and Hip medial rotation components and also to evaluate the combination of all the three sensitizing maneuvers on the hip range of motion. And cross-sectional study with 80 subjects were undertaken to study the effect of neural tension producing movement on hip flexion ROM with the addition of cervical flexion, Ankle Dorsi- flexion and Hip medial rotation components. The results of the study showed that there was significant reduction in the hip flexion angle during SLR with the addition of each sensitizing maneuvers and also with the combination of these sensitizing maneuvers. The hip flexion angle reduced significantly with neck flexion. The reason for this may be due to the cervical spine flexion produces tension in the spinal cord and dura which is transmitted caudally, pulling the nerve roots of the cauda equina cranially. Lower extremity motions which exert a caudal pull on the lumbosacral trunk and nerve roots may be restricted.

The hip flexion angle also reduced significantly with Ankle Dorsi flexion may be due to the displacement of the tibial nerve distally. The hip flexion angle also reduced with hip medial rotation may be due to the increased tension occurring in neural tissues between the dura of the spinal cord and the tibial nerve in the popliteal region is transmitted cranially or caudally.

The hip flexion angle also reduced significantly with the combination of all the three sensitizing maneuvers because of progressive uptake of the normal resting slack in the spinal dura, lumbosacral nerve roots, sciatic and tibial nerves.

Limitations:

1. The subject and lower extremity positions during testing were susceptible to human variability.
2. The maintenance of subject's ankle in a position of comfort in the neutral lower extremity positions was uncontrolled and therefore opens to variability.
3. Study did not directly investigate the mechanism responsible for restrictions in subject's hip flexion ROM.
4. Structures other than nerves and their associated connective tissue, such as blood vessels and fascia that span multiple joints in the limbs could be contributing to the alteration in the range of motion.
5. The specific limiting structures among the anatomical structures for loss of motion were unclear.

Recommendations:

1. Further exploration of muscle responses in the lower extremity in various populations of people with pain during neurodynamic testing is warranted.
2. Further investigation is needed to clarify the effect of subject discomfort as well as the role of muscles in limitations of hip flexion ROM seen during SLR testing.
3. Additional research is needed to determine the effect of applying sensitizing maneuvers in different orders of sequence during the SLR test.
4. Further studies are needed to find the effect of sensitizing maneuvers on hip flexion ROM during SLR testing in subjects with sciatica, disc prolapse.
5. Further study is required to determine which criterion provides a valid and reliable indicator of the end point of SLR and which instrument yields highest measurement objectivity among different testers.
6. Clinicians should standardize the testing procedure and document the position of the Ankle during test as Ankle Dorsi- flexion limited this angle by about 7 degrees.
7. Studies are needed to examine the relative contribution of the anatomical structures that may limit SLR.
8. Research should find out the influence of neuropathic and non- neuropathic pain on the outcome of the SLR in the asymptomatic limb.

Conclusion:

This study concludes that sensitizing maneuvers reduces Hip flexion angle ROM in asymptomatic subjects and also concludes that simultaneous application of these sensitizing movements during SLR testing results in the greatest reduction of Hip flexion angle ROM.

Thus, Experimental hypothesis is accepted and null hypothesis is rejected, which states that,

"There will be significant reduction of hip flexion angle during SLR with the addition of sensitizing maneuvers."

CONCLUSION

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Thus Experimental hypothesis is accepted and null hypothesis is rejected which states that,"There will be significant reduction of hip flexion angle during SLR with the addition of sensitizing maneuvers."

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