The Normal Response to Slump and Straight Leg Raising Test (SLR) in an Asymptomatic Subjects

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Abstract

Background: Neurodynamics is a test which check the mechanical movement of neurological tissue. It is used in an assessment to gain an impression of neural tissue mobility & sensitivity to mechanical stress. Slump and straight leg raising test are said to be the standard neurodynamics test for the lower limb.

Objectives: The aim of the study is to investigate the effect of neck and ankle position on knee and hip flexion movement during slump and straight leg raising (SLR) test and to know the neural tissue response to the neurodynamic test by addition of sensitizing manoeuver

Material and Method: It is an cross sectional study where 30 male & 30 female asymptomatic subjects in the age group of 18-39 years were taken

Results: It is concluded that there is a change in the range of movement in a normal asymptomatic subjection during Slump and SLR test. Therefore structural differentiating manouver has a significant effect on the body movement

Keywords: *Normal asymptomatic subjects, Neurodynamic test (slump & SLR test), Goniometer*

Introduction

Neurodynamic tests such as the straight leg raising (SLR) and slump test are frequently used for assessment of mechanosensitivity of neural tissue Sensitizing manoeuvres are limb or spinal movements added to neurodynamic tests, which aim to identify the origin of the symptoms by preferentially loading or unloading neural structures. A prerequisite for the use of sensitizing manoeuvres to identify neural involvement is that the addition of sensitizing manoeuvres has no impact on pain perception when the origin of the pain is non-neural.[1]

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Comprehensive evaluation of patients with low back pain must include a method of testing the integrity of related neural tissues. The straight leg raise test is recognized as the first neural tissue tension test to appear. During straight leg raise testing, the leg is elevated with the knee extended and the patient in a supine position. This places a tensile stress on the sciatic nerve and exerts a caudal traction on the lumbosacral nerve roots from L, to S,the straight leg raise test, nonneural structures, such as lumbar zygapophyseal joints, muscles, and connective tissue, can limit leg elevation and provoke patient discomfort during testing Flexing the cervical spine, dorsiflexing the ankle, and medially rotating the hip during the straight leg raise test increases tension exerted on the spinal cord, spinal dura, and lumbosacral nerve roots. In Maitland's slumptest, the patient is seated in full flexion of the thoracic and lumbar regions of the spine. Sensitizing manoeuvres are then systematically applied and released to the cervical

spine and lower extremities, while the tester maintains the patient's trunk position. The slump test evaluates the excursion of neural tissues within the vertebral canal and intervertebral foramen, detecting impairments to neural tissue mobility .They found that full spinal flexion, or flexion of the cervical, thoracic, and lumbar regions of the spine, produces lengthening of the vertebral canal. When the vertebral canal is elongated, the spinal dura is stretched, transmitting tension to the spinal cord, lumbosacral nerve root sleeves, and nerve roots. During full spinal flexion, the cauda equina becomes taut and the lumbosacral nerve roots and root sleeves are pulled into contact with the pedicle of the superior vertebra. When extension of the cervical spine is introduced, the dura and the nerve roots slacken as the vertebral canal begins to shorten. Extending the thoracic and lumbar spine increases the slack in the neural tissues as the vertebral canal continues to shorten.[2]

The straight leg raise (SLR) is a common neurodynamic test used to examine the mechanosensitivity of the lower extremity nervous system in individuals with low back or lower extremity pain. The SLR consisted of placing the knee in end range extension, determined by the examiner as end range resistance, followed by bringing the limb into hip flexion Pre-positioning in ankle dorsiflexion compared to plantar flexion is commonly utilized for purposes of structural differentiation during SLR testing. The movement was stopped at the first moment any sensory response was indicated, including but not limited to the sensation of stretch, pulling, tension, pain, numbness, or tingling.[3]

Methodology

1. **Study design:** Cross sectional study
2. **Study set up:** Physiotherapy department
3. **Selection criteria:**

Inclusion Criteria:

- Asymptomatic subjects were taken
- Age group 18-39 yrs

Exclusion Criteria:

- H/O of low back pain
- Joint injury
- Neurological or vascular impairment

Materials Used: Goniometer

Procedure: Permission to carry out the research were taken from the ethical committee of the Datta Meghe college of Physiotherapy, Nagpur. Subjects who were volunteered to participate in the study were selected keeping in view of inclusion and exclusion criteria. Structural differentiation or sensitizing manoeuvre have a significant effect on test response in terms of range of movement during neurodynamic tests.

The Slump & SLR tests are standard neurodynamics tests for the lower limb, it is demonstrated as follows:

Slump Test Procedure: The subject should be sat on table with the pelvis fixed and thigh fully supported with knees together. The patient is asked to slump the back into thoracic and lumbar flexion. A strap is positioned across the shoulder to maintain thoracic and lumbar flexion so that patient maintain the chin in neutral position. A universal goniometer was placed i.e stationary arm between lateral condyle of knee and greater trochanter and moving arm of goniometer should be placed between lateral condyle of knee and lateral malleolus of ankle. The zero was taken as the point of full extension.

For cervical flexion, the subject was asked to put their chin to chest & the examiner applied ankle dorsiflexion and passively extend the knee until the onset of resistance, then the range of knee flexion should be measured relative to zero. All time, the subject was monitored for the presence of adverse symptoms during testing.

Straight Leg Raising Test Procedure: The subject should be in a supine lying position with the trunk,shoulder and hip in a neutral position. A goniometer was positioned with the stationary arm aligned between the greater trochanter and midline of trunk and moving arm aligned between greater trochanter and lateral condyle of femur. The examined leg should be kept in full extension by placing the examined hand on thigh proximal to knee and other hand under the heel. Subjects were asked to dorsiflex the foot and elevates the leg in a sagittal plane about the hip joint until the onset of resistance. Then the range of hip flexion should be measured relative to zero.

All time, the subject was monitored for the adverse symptoms during testing.

Outcome Measures:

Knee flexion ROM during Slump test

Hip flexion ROM during straight leg raising test

Results

Table No. 1: Distribution of subjects according to age

Age Group	No of Subject	%
19-28	48	80
29-38	12	20
Total	**60**	**100**

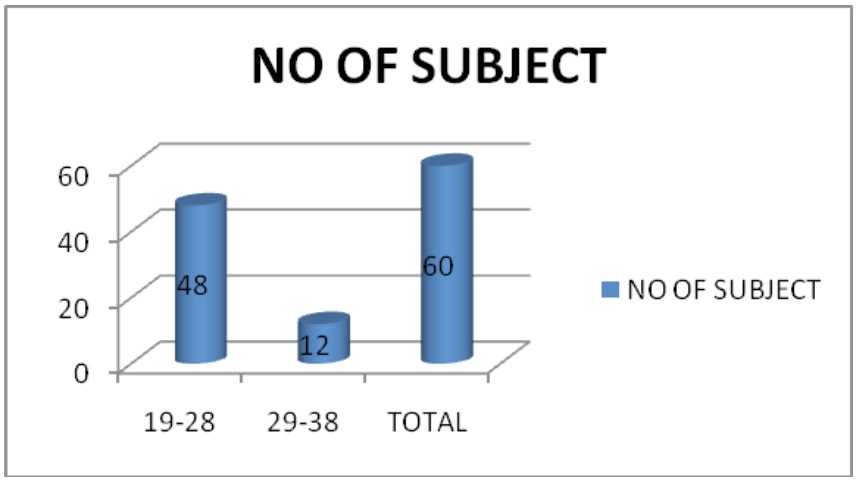

Figure 1

Table no 1 shows that, total 60 subjects were taken out of which 48 were participated in the age group of 19-28 years whereas 12 subjects in the age group of 29-38 years

Table No 2: Distribution of subjects according to Gender

Gender	No of Subject	%
Male	30	50
Female	30	50
Total	**60**	**100**

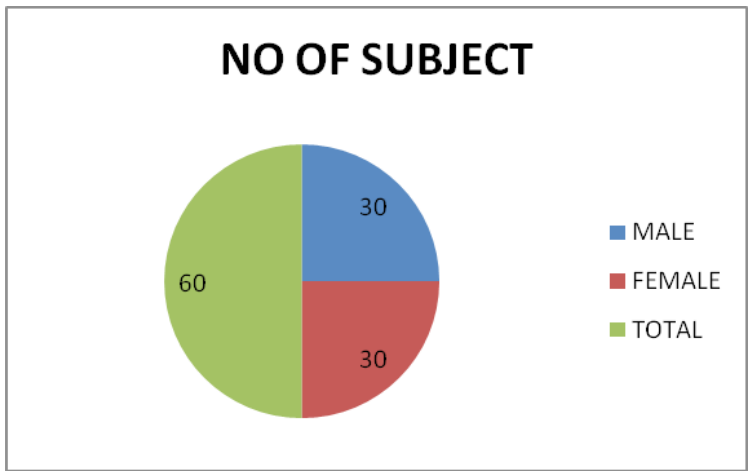

Figure 2

Table no 2 shows that total 60 subjects were taken out of which 30 male & 30 female who were volunteered to participate in the study in the age group of 19-38 years.

Table No 3: Mean and S.D of Flexion

	Male	Female
Knee flexion at slump neck flexed	42.7	37.77
Knee flexion at slump neck extended	48.6	47.6
SLR hip flexion at ankle dorsiflexion	73.9	73.3
SLR hip flexion at ankle neutral	82.23	81.23

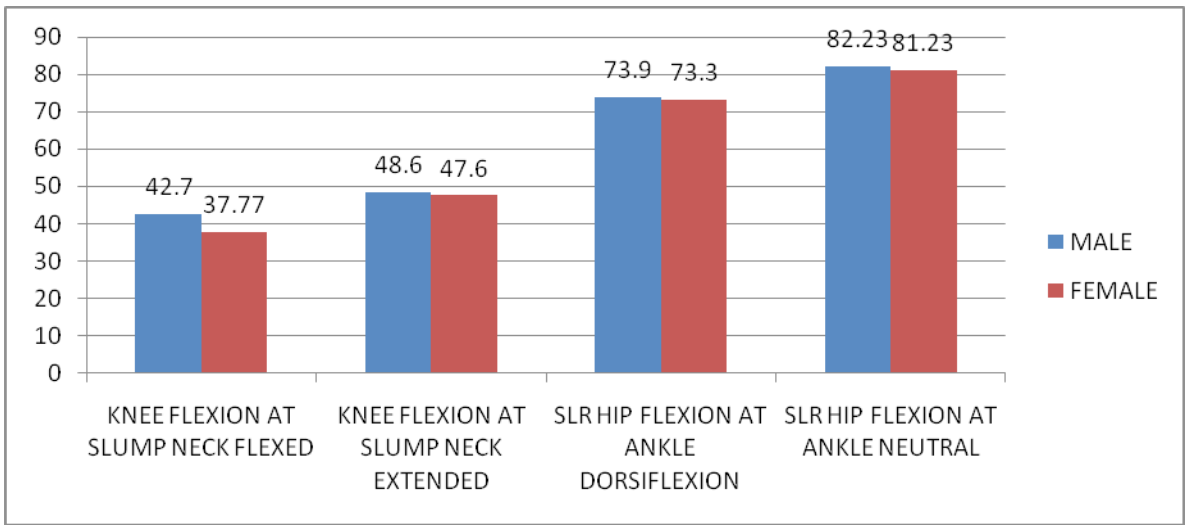

Figure 3

Table no 3 shows that range of knee and hip flexion angle during slump test and straight leg raising (SLR) test .It is found that there is an significant difference in knee & hip flexion angle in both male and female subjects.

Discussion

All data were analysed using statistical package, 60 subjects were taken (30 male and 30 female) who were volunteered to participate in the study between the age groups of 19-38 years. Structural differentiation or sensitizing manoeuvre have a significant effect on test response in terms of range of movement during neurodynamic tests. Cervical flexion & cervical extension during slump test whereas ankle dorsiflexion & ankle neutral during straight leg raising test act as a sensitizing manoeuvre. During slump test it is observed that knee flexion angle decreases when cervical flexion component wasadded, on the other hand knee flexion angle increases when cervical extension component was added both in male and female subjects.

This is supported by the study of P.C Lew, CA. briggs et al who conducted a study on asymptomatic patients between the age groups of 18-30 years he found that whether changing the cervical position during slump test altered posterior thigh pain/or tension in hamstring muscles,and there is an averaged over the group there was a 40% decrease in posterior thigh pain with cervical extension,it indicates that cervical movement did not change hamstring muscle tension the change in experimentally induced pain during cervical flexion was not due to change in hamstring muscle,it is concluded that posterior thigh pain caused by slump test and relieved by cervical extension arises from neural structures rather than hamstring muscle.[4]

This is also supported by Ketakijoshi, charu. Eapen et al who determine normal sensory and ROM responses during the movement components of thoracic slump test in an asymptomatic subjects,he conducted slump test in two sequences,proximal initiation which was proximal to distal and distal initiation which was distal to proximal its results shows the prevalence of sensory responses, its nature area and intensity,it concluded that the intensity of symptoms of proximal initiation

sequences was significant (p>0.05) when compared to distal initiation sequences and there is a change in ROM was significant for distal initiation when compared to proximal initiation,these normal responses is used as a reference when using thoracic slump test.[5]

During straight leg raising test it was found that there was a diminished range of hip flexion due to addition of ankle dorsiflexion, and increase in hip flexion due to addition of ankle in neutral position .Ankle dorsiflexion and neutral act as a sensitizing manoeuvre. The study was based on a sample of asymptomatic subjects in response to standard Neurodynamic test during slump and SLR test following the addition of structural differentiating manoeuvre.This study is supported by Benjamin s Boyd et al who conducted a cross sectional observational study on 20healthy subjects without low back pain,he measured hip flexion angle and surface electromyographic measures were taken and compared at the onset od symptoms P1 and at the point of maximally tolerated symptoms during SLR with ankle dorsiflexion and ankleplanter flexion, he concluded that addition of ankle dorsiflexion during SLR testing induces earlier distal muscle activation and reduces hip flexion motion.[6-8]

Ethical Clearance: Taken from institutional ethics committee.

Source of Funding: Self.

Conflict of Interest: Nil.

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