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Original Research Article

# Comparison of effect of different sensitizing manoeuvres on Slump test in patients with low back pain having normal and overweight Body Mass Index

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## Abstract

**Introduction:** Slump test, a neurodynamic test, is used to test mechanical movement of the neurological tissues and to test their sensitivity to mechanical stress. Various studies have found that neural tissue mobility differs in normal young adults with different body mass index (BMI). This study aimed at finding out whether the neural mobility is different in patients with different BMI having low back pain with or without radiculopathy.

**Objective:** To compare the effect of different sensitizing manoeuvres on slump test in patients with low back pain having normal and overweight BMI.

**Material and methods:** 30 patients having low back pain with or without radiculopathy were divided in two groups, one group (A) had patients with underweight and normal BMI and the other group (B) had overweight and obese subjects. Patients with conditions like infection, tumor, osteoporosis, spinal surgery and pregnancy were excluded. The outcome measure used was the popliteal angle. The readings were taken in four positions namely cervical spine neutral with ankle neutral, cervical spine neutral with ankle dorsiflexion, cervical spine flexion with ankle neutral, and cervical spine flexion with ankle dorsiflexion and were compared on both the sides. Thoracic and lumbar spine was maintained in flexion in all positions. Level of significance was kept at 5%.

**Results:** The difference in the means of popliteal angle deficit score on both the right and left sides between groups A and B in all four positions was found to be statistically significant.

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**Conclusion:** Neural tissue extensibility is reduced in overweight and obese patients with low back pain compared to the patients having normal and underweight BMI.

## Key words

Popliteal angle, Low back pain, Sensitizing manoeuvres, Slump test.

## Introduction

Overweight and obesity are defined as abnormal or excessive fat accumulation that can impair health. BMI provides the most important population level measure of overweight and obesity as it is same for both sexes and for all ages of adults. BMI is calculated as weight in kilograms divided by height in meters squared ($kg/m^2$) [1]. The World Health Organization (WHO) classification of BMI is as per **Table – A** [2].

**Table - A:** WHO classification of BMI.

| Group | BMI |
|---|---|
| Underweight | <18.5 |
| Normal weight | 18.5-22.9 |
| Overweight | >23 |
| At risk | 23-24.9 |
| Obesity 1 | 25-29.9 |
| Obesity 2 | >=30 |

Studies have correlated obesity with various systems in the body which include balance, proprioception, flexibility and cardiovascular fitness [3]. Very few studies have been found correlating overweight and neural tissue extensibility. Obesity assessment includes flexibility, muscle power, fitness testing, balance, body mass index and waist hip ratio but does not include the assessment of neural tissue mobility. There are studies performed comparing the changes in neurodynamic responses on adding sensitizing manoeuvres on slump test in asymptomatic individuals who have normal weight and who are obese [4]. Very few studies are available testing the nature of response on adding sensitizing manoeuvres in symptomatic group of subjects [5]. Low back pain is defined as pain localised between the 12th rib and inferior gluteal folds, with or without leg pain [6], the majority of patients most probably have a multi-factorial cause for back pain, which includes functional instability, deconditioning, abnormal posture, poor muscle recruitment, emotional stress and changes associated with ageing and injury such as disk degeneration, arthritis and ligamentous hypertrophy [7]. Hence, the purpose of this study was to compare the effect of different sensitizing manoeuvres on slump test in patients with low back pain with or without radiculopathy having underweight and normal and overweight and obese BMI.

## Material and methods

An observational study was conducted at College of Physiotherapy in V.S. General Hospital, Ahmedabad which included 30 patients having low back pain with or without radiculopathy. Patients with conditions like tumor, infection, osteoporosis, previous spinal surgery and pregnancy were excluded. The patients were divided into two groups, one group (A) had patients who were underweight or had normal BMI and other group (B) had overweight and obese patients according to their BMI. The outcome measure used was popliteal angle.

The subjects were positioned sitting on a chair until the back of the knees were against the front of the edge of the chair. The thighs were fully supported and maintained parallel to each

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other and hands linked behind the back. The goniometer was positioned with its stationary arm aligned between the lateral condyle of knee and the greater trochanter and the movable arm aligned between the lateral condyle of knee and the lateral malleolus of the ankle [8]. Thoracic and lumbar spine were maintained in full flexion, over pressure was applied with the medial aspect of forearm by one therapist Knee extension was performed at the end of each of the following positions and popliteal angle was measured by another therapist.

- **Position 1:** Cervical spine and ankle neutral.
- **Position 2:** Cervical spine neutral and ankle dorsiflexion.
- **Position 3:** Cervical spine flexion and ankle neutral.
- **Position 4:** Cervical spine flexion and ankle dorsiflexion.

**Statistical analysis**

Level of significance was kept at 5%. Mann-Whitney 'U' test was used to analyze the popliteal angle deficit score between group A and group B in all four positions.

## Results

The comparison of mean and SD of popliteal angle in various positions in both groups in right and left lower limbs were as per **Table -1, Table – 2, Table – 3** and **Table - 4**.

**Table - 1:** Position 1: Cervical spine and ankle neutral.

| Group | Mean and SD of popliteal angle - Right | Mean and SD of popliteal angle - Left |
|---|---|---|
| A | 11.29±4.56 | 11.27±4.8 |
| B | 20.33±6.38 | 20.73±7.57 |
| U value | 29.50 | 35.5 |
| 'p' value | 0.001 | 0.001 |

**Table - 2:** Position 2: Cervical spine neutral and ankle dorsiflexion.

| Group | Mean and SD of popliteal angle - Right | Mean and SD of popliteal angle - Left |
|---|---|---|
| A | 11.94±7.50 | 12.200±4.75 |
| B | 22.07±7.5 | 21.8±7.10 |
| U value | 29.50 | 30 |
| 'p' value | 0.001 | 0.001 |

**Table - 3:** Position 3: Cervical spine flexion and ankle neutral.

| Group | Mean and SD of popliteal angle - Right | Mean and SD of popliteal angle - Left |
|---|---|---|
| A | 13.67±4.53 | 13.4±4.77 |
| B | 23.6±7.33 | 21.67±6.33 |
| U value | 27 | 34.5 |
| 'p' value | 0.001 | 0.001 |

**Table - 4:** Position 4: Cervical spine flexion and ankle dorsiflexion.

| Group | Mean and SD of popliteal angle - Right | Mean and SD of popliteal angle - Left |
|---|---|---|
| A | 15.74±4.52 | 14.86±5.76 |
| B | 26.2±7.87 | 26.94±8.86 |
| U value | 26.5 | 26.5 |
| 'p' value | 0.0001 | 0.0001 |

The difference in means of the popliteal angle deficit score on the right and the left side between groups A and B in all four positions was found to be statistically significant.

## Discussion

The study compared neurodynamic responses of different sensitizing manoeuvres' on slump test in patients with low back pain having normal, underweight and overweight and obese BMI.

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The result of the study revealed that neural tissue extensibility was reduced in over weight and obese patients as compared to patients having normal and underweight BMI.

As found in the current study, the difference in mean popliteal angle deficit score was statistically significant in both the groups in all four positions with p value of < 0.001.

Venkateswaran M, et al. conducted similar study on asymptomatic young adults, active knee extension deficit angle was found to be higher in overweight adults than normal young adults [9]. Park W, et al. in their study on the effect of obesity on active joint range of movement (ROM) in males found that ROM is reduced in obese individuals than individuals having normal BMI [10].

According to Michael Shacklock, during slump test there is tension and compression on the neural structures. Tension with spinal flexion passes along all the spinal neural tissues to the point where the filum terminalae is elongated as the spinal cord moves in a cephalad direction in the spinal canal. Neck flexion transmits significant tension to the lumbosacral nerve roots. Tension in the nerve roots produces a reduction in intra neural blood flow. At 8% elongation the venous blood flow from the nerves starts to reduce and at 15 % all circulation in and out of the nerve is obstructed which is caused by stretching and strangulation of the vessels; also it reduces blood flow in the spinal cord. So tension and compression on neural tissues are more likely to fail in the presence of mild tightness [11].

Shiri R, et al. in their meta analysis found that compared to people with normal BMI, overweight and obese individuals have a higher prevalence of low back pain [12]. This suggests that BMI has an effect on prevalence of low back pain. Increased volume of interface in overweight individuals may result in decreased sliding of nerves and neural flexibility is also reduced in individuals with increased BMI even without back pain [10]. Adhesions in the neural tissue or surrounding tissues can reduce the mobility of the nerve in its bed; this limited mobility can lower the threshold at which traction begins to produce physiological and structural effects on neural structures [13]. Protective contraction in the hamstring muscles found in the presence of neural mechanosensitivity may account for hamstring tightness [14]. A systemic review of Passive Straight Leg Raise (PSLR) test as a diagnostic aid for low back pain found that hamstrings were found to have defensive role in protecting nerve roots by limiting PSLR range in the cases of nerve root involvement [15]. However in the present study hamstring flexibility was not measured. Also duration of back pain was not taken into consideration.

Thus it is seen that neural tissue mobility is decreased in obese patients with low back pain more than patients with normal BMI. So this needs to be taken into consideration while planning for management in subjects who have back pain and are obese.

## Conclusion

The neural tissue mobility was found to be decreased in overweight and obese patients with back pain as compared to patients having underweight and normal BMI.

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