

Original Research Article

Correlation between hamstring flexibility and incidence of low back pain in physiotherapy students

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ABSTRACT

Background: Due to mobile phones and other devices, students are becoming more sedentary these days. Their muscles become rigid as a result of their inactivity. Therefore, our study must analyze the problem of hamstring flexibility and determine the prevalence of low back discomfort among students. The current study aimed to observe the difference in hamstring muscle flexibility. The difference between dominant and non-dominant legs and to determine the correlation between low back pain and hamstring muscle flexibility.

Methods: One hundred students both male and female with hamstring flexibility of at least 150 have been included in this study. Hamstring muscle shortening was examined by the active knee extension test and straight leg raising test, While the low back disability stage was assessed by Oswestry disability index.

Results: The straight leg rising and the active knee extension test (AKE) of the right leg were significantly more flexible than the left side. There was a weak positive non-significant correlation between ODI and AKE of the; right side ($r=0.133$, $p=0.70$) and the left side ($r=-0.119$, $p=0.80$). There was weak negative non-significant correlation between ODI and straight leg raising test (SLR) of the right side. There was a weak positive non-significant correlation between ODI and SLR of the right and left side.

Conclusions: The results of this study should demonstrate a negative correlation and no discernible link between LBP and hip and knee hamstring flexibility.

Keywords: Hamstring muscle flexibility, Mechanical low back students, Straight leg raising test, Active knee extension test

INTRODUCTION

Anatomically hamstring muscles are originated from the inferomedial impression on the upper part on the ischial tuberosity and inserted on the upper part of the posterior surface of tibia. Because of this hamstring tightness can cause low back discomfort by decreasing lumbar lordosis and producing a posterior pelvic tilt.¹ Pelvic motion was further reduced by the non- extensibility of the hamstring muscles. This inactivity result in biomechanical modification to the spine pressure distribution and

subsequent.² Thus, alterations in lumbo plevic rhythm, low back discomfort and thoracic kyphosis, spondylolysis disc herniation have all been linked to pool hamstring extensibility. In addition, those shortened hamstring muscles have a restricted gait, a higher chance of falling and are more vulnerable to musculoskeletal disorders. Three distinct parts that are all situated in the rear end of the thigh area make up the hamstrings. They are the long heads of the biceps femoris laterally, semitendinosus and semimembranosus medially. Between hip and knee is where the hamstring was situated. A single tendon

connects the long head of the biceps femoris, semitendinosus and ischial tuberosity, which are the origin of all three muscle. The semitendinosus and semimembranosus the medial sections are roughly 44.3 and 38.7 cm long respectively.² The semimembranosus attaches to the posterior side of the tibial medial condyle, While the semitendinosus inserts into the medial condyle of the tibia via the pes anserinus tendon.³ Among women 96% of them tightness is more common than in men 4%. It is more common among college students between the ages of 18 to 25.⁴ Reduced hamstring flexibility is a risk factor or the development of tendinopathy in patellar femur injuries hamstring pain in patellar femoral injuries and symptoms of muscle injury following eccentric exercises.⁵ It may cause problem with the biomechanical of the knee, hip, ankle and reaction force.⁶ Low back pain (LBP) can be caused by tight hamstring which can also produce. A posterior pelvic tilt and a decrease in lumbar lordosis.^{7,8} LBP causes hamstring muscle reflex tightness and is associated with the patient's daily activities or their line of work actions or alignment. Students with LBP typically experience hamstring tightness that is unrelated to their lifestyle of the environment.⁹ The general phrase used to describe any type of back discomfort brought on by placing exercises strain and tension on the spinal column muscles hurt mechanically.^{10,11} Mechanical discomfort typically results from improper actions when the hamstring and lower back muscles. Muscles tense, resulting in bad posture with incorrect construction and incorrect bending and deviating motions. The hamstring supports the lumbar regions spinal curve when it is flexed. If you have hamstring tightness in the lumbar region the spinal and lower back pain. Students' exposure to instructional activities, including sitting and gazing down while studying back discomfort in students. Students' years of education are also connected to low back pain. Students are more prone to lower back musculoskeletal ailments when they sit through an intense curriculum, execute clinical work in an arrogant posture and limited their movement to extension. Transferring and lifting patients are the most frequency risks for students. Working for extended amount of time in uncomfortable position and doing repetitive task, such as bending, twisting and static posture that causes the spine to flex or rotate more than 200 from its neutral position. Lower back pathology result in aberrant segmental control and a deficiency in motor recruitment which weakness the transverses abdominis and lumbar multifidus muscles. The current study aimed to observed the difference in hamstring muscle flexibility. The difference between dominant and non-dominant legs and to determine the correlation between LBP and hamstring muscle flexibility.

METHODS

This observational study was conducted on college going students' population selected from School of physiotherapy, Sri Balaji Vidyapeeth, Puducherry. The sample consist of 100 individuals aged between 18-24 years. Exact study period January 2024 to June 2024 Both

male and female students involved. Inclusion criteria of the study were prolonged sitting on the chair for 6 hours per day minimally for at least 5 days per week for minimum 6 months and finally with at least 150 losses of the extension during AKE test and during active SLR test. Participants with severe spinal disorders, history of hamstring injury past 2 years, fracture in lower limb, congenital deformity, obesity, psychological disorder, leg length shortening were excluded from the study. Participants were selected using convenient sampling method. The present study was approved by the Ethical committee of Sri Balaji Vidyapeeth of Deemed University (Pondicherry). All participants signed a written informed consent before the examination.

Procedure

Phase 1: active knee extension (AKE) test

It is a process to measure how tight your hamstring are participants were instructed to maintain flexion in both lower limbs while lying supine on a plinth. In order to modify the anterior superior iliac spine, pillows were utilized. One examiner covered the lower third of the thigh with her hands to secure the untested lower limb to the plinth. The participants were instructed to extend their knees and hips to 90 degrees until their legs and thighs touched the pillows.

A second examiner instructed participants to extend their knee as far as possible and hold it there for around five seconds while keeping their foot relaxed. A universal goniometer was positioned with its arms set parallel to the femur and tibia, marking the joint axis.

The participants were instructed by the examiner to keep their feet relaxed and flex downward. Consequently, the gastrocnemius passive insufficiency is prevented and the pressure on the neural structures in the posterior portion of the lower limb is lessened. The knee flexion degree from the previous knee extension was used to measure this test. Every knee angle was measured three times, with a one-minute break in between and the mean was computed for the AKE test analysis.

Phase 2: straight leg raising (SLR) test

A table was employed for the examination in order to apply this test. During the test, participants were to remain relaxed and in supine posture. The examined limb was voluntarily flexed by the subjects, who maintained a relaxed foot and extended knee. The examiner placed the hip in neutral rotation and fully extended the contra lateral limb. The exercises were terminated as soon as the individual experienced a strong along the posterior portion of the thigh. A different examiner placed the goniometer on the greater trochanter of the hip, aligning the stationary arm parallel to the midaxillary line and the movable arm with the lateral femoral condyle.

The mean result was included in the statistical analysis after the measurement was completed three times with a one-minute break in between trails.

Phase 3: Low back questionnaire

Distribute the ODI questionnaire to gather data on low back discomfort throughout everyday activities.

Data collection procedure

The population of low back pain physiotherapy students at the school of physiotherapy, SBV, Pondicherry, served as the study population.

A sample size of one hundred was selected based on the inclusion and exclusion criteria. One group consists of one hundred students. SLR, AKE test and ODI questionnaire are all the three phase protocol. The purpose of the ODI questionnaire is to ascertain the correlation between hamstring flexibility and the incidence of low back pain, following the completion of the SLR and AKE tests.

Statistical analysis

While frequencies and percentages were used to summarize categorical variables, mean and standard deviations were used to summarize quantitative variables. The association between ODI, AKE and SLR was examined using the spearman correlation coefficient. The comparison of AKE and SLR between the right and left sides was done using a paired t-test.

All statistical tests were conducted with a significance level of $p < 0.05$. The statistical program for social studies was used to perform all statistical analyses.

RESULTS

Analysis of demographic data

Out of 100 participants 41 (41%) were male and 59 (59%) were females.

Table 1: Size distribution of participants.

Gender	Size	Percentage (%)
Male	41	41
Female	59	59

Subject characteristics

100 subjects participated in this study. The mean±SD age and body mass index (BMI) of the study group were 20.73±1.62 years and 22.02±2.47 kg/m² respectively in Table 2.

Our previous study data is subjects' characteristics 100 female subjects participated in this study. The mean±SD age and BMI of the study group were 20.87±1.19 years and

23.43±4.09 kg/m² respectively. 95% had the right side dominant and 5% had the left side dominant.

AKE, SLR and ODI of the study group

The mean±SD of our study AKE of the right and left legs was 34.34±15.68 and 33.88±16.080, respectively. The mean±SD SLR of the right and left leg was 52.20±15.88 and 51.48±16.100, respectively. The mean±SD ODI was 10.04±19.22. Previous study data AKE, SLR and ODI of the study group.

The mean±SD AKE of the dominant and non-dominant legs was 25.17±7.1 and 25.93±7.34 degrees, respectively. The mean±SD SLR of the dominant and non-dominant legs was 19.83±8.76 and 22.03±9.230, respectively. The mean±SD ODI was 4.84±5.65 as shown in Table 3.

Table 2: Participant characteristic.

Characteristics	Mean±SD
Age (years)	20.73±1.62
Weight (kg)	60.70±8.73
Height (cm)	166.04±9.04
BMI (kg/m ²)	22.02±2.47

Table 3: Study interpretation of (AKE, SLR and ODI).

Characteristics	Mean±SD
AKE of the dominant side	23.17±7.1
AKE of the non-dominant side	25.93±7.34
SLR of the dominant side	19.83±8.76
SLR of the non-dominant side	22.03±9.23
ODI	4.84±5.65

Comparison if AKE and SLR between the right and left sides.

There was a significant decreased in AKE and SLR of the right side compared with that of the left side ($p < 0.05$) (Table 4).

Relationship between ODI, AKE and SLR

There was a weak positive non-significant correlation between ODI and AKE of the right side ($r = 0.133$, $p = 0.70$) and the left side ($r = -0.119$, $p = 0.80$). There was a weak positive non-significant correlation between ODI and SLR of the right and left side. But the previous study relationship between ODI, AKE and SLR is There was a weak positive non-significant correlation between ODI and AKE of the dominant side ($r = 0.162$, $p = 0.1$) and the non-dominant side ($r = 0.071$, $p = 0.48$).

There was a weak negative non-significant correlation between ODI and SLR of the dominant side ($r = -0.29$, $p = 0.77$) and the non-dominant side ($r = -0.53$, $p = 0.6$).

Table 4: Comparison of AKE and SLR between the right and left side.

Comparison	Right, mean±SD	Left, mean±SD	MD	t	P value
AKE	34±15.68	33.88±16.08	0.46±0.4	0.3778	0.7064
SLR	52.20±15.88	51.98±16.13	0.22±0.25	0.2435	0.8081

Correlation between ODI and AKE (R), ODI and AKE (L), ODI and SLR (R), and ODI and SLR (L) were shown in Figures 1-4.

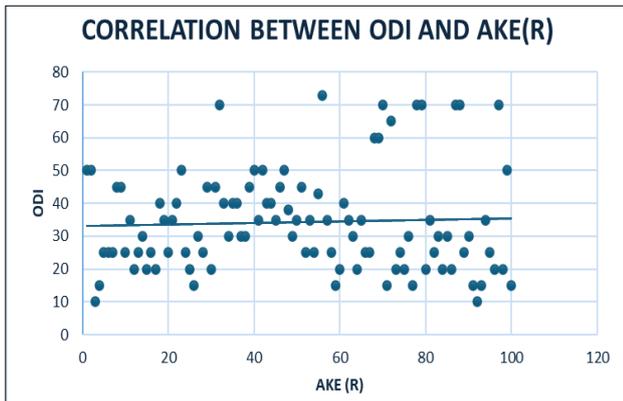


Figure 1: Correlation between ODI and AKE (R).

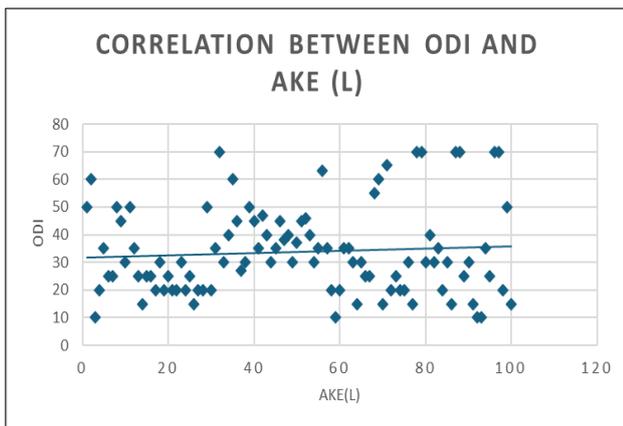


Figure 2: Correlation between ODI and AKE (L).

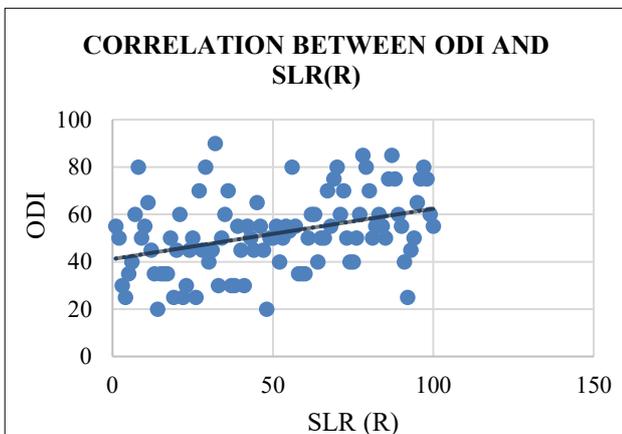


Figure 3: Correlation between ODI and SLR (R).

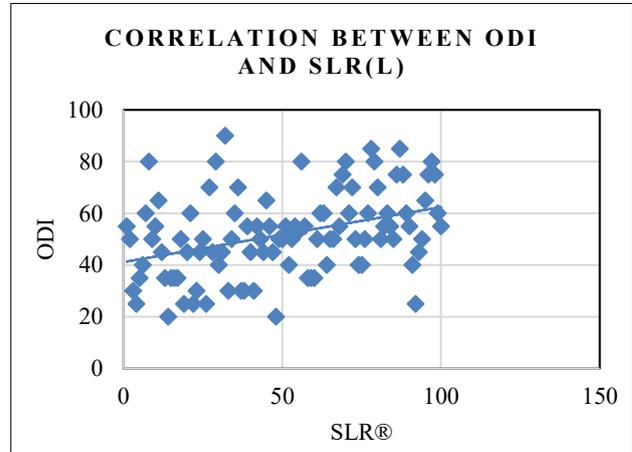


Figure 4: Correlation between ODI and SLR (L).

DISCUSSION

Present in subjects with low back pain the hamstring extends the hip joint and flex knee joint. They are situated on the posterior part of the thigh and connect the power pelvic to the lower extremities. Several muscle groups attach the top part of the pelvic to the spinal column. These Muscles which run the length of the spine, control mobility, stability and posture of the spine. The range of motion in the pelvic is restricted by the thigh hamstrings. Limitations in pelvic motion can cause the muscles in the low back to tighten up as well, which will ultimately lead to LBP. According to our finding, there is a slight positive association between students hamstring muscles shortening and low back pain. Exercise on a regular basis aid in increasing pelvic rotation and trunk flexion range, even if the current study indicated a slight positive correlation between hamstring tightness and low back pain. This is because exercise promotes healthy hamstring muscle flexibility. The present study results demonstrated a not significant difference (p=0.70 for AKE and p=0.80 for SLR) between the right and left side.

At the knee and hip levels, the right-side exhibits less hamstring stiffness than the left side. Our findings are consistent with Radwan et al who discovered that the non-dominant lower extremity hamstring was tighter than the dominant lower extremity.¹² In the dominant and non-dominant sides, the current study links between ODI and AKE revealed a mild positive and non-significant correlation. In line with our findings, a study by Koley and Likhi that looked at the connection between low back pain and tight hamstrings also found that there was a weak positive correlation substantial correlation on both sides between ODI and SLR One of the studies done by Koley et al in 2011 proved that due to lack of adequate physical

activity, muscle weakness, some degenerative factors, viz. osteoarthritis, senile osteoporosis, and degenerative disc diseases etc., low back pain occurs in elderly people.¹⁴ And it also predicted that prolonged tight hamstring muscles can cause back pain.¹⁵ This finding is similar to the present study. Helsing measured the hamstring tightness of 600 young males. There was a lot of tight hamstring muscle found in these groups.¹⁴ Although hamstring flexibility is linked to forward bending range and pelvic rotation, it might not have any bearing on lumbar issues because according to Tafazzoli and Lamontagne, those with LBP

had far more hamstring tightness than those without LBP. Patient with and without lower back pain were compared for hamstring flexibility by Srinivasan and Nandi. They made a comparison of the two legs flexibility, which has great therapeutic relevance. Assessed the subject's variation in hamstring flexibility and its relationship to the intensity of LBP. The ODI scores and hamstring tightness showed a positive link, indicating that the greater the ODI grade, the tight the hamstring muscles.¹⁵ There is some limitation in equal distribution of sample male and female, there is no equal distribution of sample.

Table 5: Comparison of AKE and SLR between the right and left side.

	Right mean ±SD	Left mean ±SD	MD	t-value	P value
AKE	33.34±15.68	33.88±16.08	0.46±0.4	0.3778	0.7064
SLR	52.20±15.88	51.98±16.13	0.22±0.25	0.2435	0.8081

CONCLUSION

The result of the current study showed negative correlation and not significant relation between LBP and flexibility of hamstring at the level of knee and hip joint.

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