*Journal of Pharmaceutical Research International*

***33(40A): 282-287, 2021; Article no.JPRI.71770***
***ISSN: 2456-9119***
*(Past name: British Journal of Pharmaceutical Research, Past ISSN: 2231-2919, NLM ID: 101631759)*

# Correlation of Hamstring Flexibility with Sitting Hours and Physical Activity among Physiotherapy Students

**Maitri Shukla[1] and Purvi Patel[1*]**

*[1]College of Physiotherapy, Sumandeep Vidyapeeth an Institution Deemed to be University, Piparia, Waghodia, Vadodara, Gujarat, 391760, India.*

***Authors' contributions***

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

***Article Information***

DOI: 10.9734/JPRI/2021/v33i40A32245
Editor(s):
(1) Dr. Aurora Martínez Romero, Juarez University, Mexico.
Reviewers:
(1) Habil. Márta Hock, University of Pécs, Hungary.
(2) Abinet Dagnaw Mekuria, Debre Berhan University, Ethiopia.
Complete Peer review History: https://www.sdiarticle4.com/review-history/71770

***Original Research Article***

***Received 25 May 2021***
***Accepted 01 August 2021***
***Published 07 August 2021***

## ABSTRACT

**Background:** The hamstring group is an example of muscles which is commonly found to be shortened. Hamstring tightness is caused by extended or prolonged sitting at work places and educational institutions, inadequate physical activity, genetic predisposition, previous injury to hamstring.
**Objectives:** To assess the hamstring flexibility in college students along with their sitting hours and physical activity.
**Material & Methods:** 150 students of college of physiotherapy were included via convenient sampling in the study. Popliteal angle was measured using active knee extension test (AKE). All students' sitting hours and physical activity were noted.
**Results:** In this study, mean values of popliteal Angle was higher than 20 degree. There was a significant difference correlation between popliteal angle and sitting hours as well as physical activity (p value <0.05).
**Conclusion:** This study showed tightness of hamstring in college students. There is a significant increase in tightness with more sitting and less physical activity.

**Corresponding author: E-mail: purvi.cop@sumandeepvidyapeethdu.edu.in, purvi840@gmail.com;*

*Keywords: Hamstring tightness; popliteal angle; active knee extension test (AKE); flexibility.*

## 1. INTRODUCTION

Flexibility is the muscle's ability to lengthen and allowing a joint to move through a range of motion (ROM). Flexibility of muscle allow individual to move smoothly which increases both safety and optimal physical activity [1]. "Flexibility" and "muscle length" words are used frequently in the literature for hamstring muscle end range lengthening [2].

The hamstring group is an example of muscles which is commonly found to be shortened. It consists of semitendinosus, semimembranosus, biceps femoris, and hamstring part of adductor magnus. Hamstrings have multiple attachments which give impactful function of muscle throughout the pelvis and lower extremities. Tightness of hamstrings may influence pelvic tilt and rotation, sacral rotation and extension and rotation of hip resulting into faulty alignment of spine as the short hamstring muscles tends to rotate the pelvis posteriorly and disturb the normal mechanics of joint where it acts upon [2,3].

There are many complications that arise due to hamstring tightness. Much of the biomechanical analysis of hamstring function shows that maximal lengthening of hamstring occurs at the end of the swing phase of gait, just prior to foot contact, when the hip is flexed and knee flexion moment is reducing which also can be affected in people with hamstring tightness. It can cause Posterior pelvic tilt which leads to flat back posture, which if unaddressed leads to low back pain. Studies have found a relationship between hamstring flexibility and limited hip motion has been demonstrated in low back pain (LBP) patients. It may also cause instability of SI joint and spondylolisthesis in chronic cases [1,2,4,5].

Hamstring tightness is caused by extended or prolonged sitting at work places and educational institutions, inadequate physical activity, genetic predisposition, previous injury to hamstring [6]. Morden sedentary life style is one of the main reasons for postural abnormality. Most of the work place and educational setups have prolonged sitting hours which can easily hampered flexibility of soft tissues, especially in muscle which has multiple attachments [6,7]. Studies show that hamstring tightness is more prevalent in female than compare to male. Many studies are showing that athletes have higher rate of hamstring tightness. It is more prevalent after pubertal growth spurt (14 to 19) years linked with natural evaluation of lumbar lordosis and pelvic tilt [1,8,9]. Therefore it is essential to be aware of hamstring tightness to prevent injuries.

There are several tests employed to assess hamstring flexibility, like sit and reach test (SRT), chair SRT, back saver SRT, active knee extension (AKE) test, passive knee extension test etc. We have chosen to measure hamstring flexibility by Active knee extension test. The test involves active knee extension and is safe. It shows that individual presenting with reduced flexibility have higher variability in flexibility measures mainly due to pelvic compensation [10,11].

It is important to study hamstring flexibility in students who have long sedentary hours of studying along with lack of physical activities to create awareness about lack of normal flexibility and preventing complications. Therefore present study measured the hamstring muscle flexibility in college students. This study may give light on student's educational sitting arrangement setups and value and need of co-curricular physical activities in routine day to day life.

## 2. MATERIAL AND METHODS

Students of college of physiotherapy, Sumandeep Vidyapeeth were approached for the study. Self-declared healthy adult students within age range of 18 to 30 years who are ready to take part in the study were included. Participant who have sprain or strain around knee or hip, any recent surgeries around hip and knee joints, recent history of fracture, or any other neurological and musculoskeletal problems were excluded from the study. All The participants who were satisfy the inclusion criteria were enlightened about the study plan of action and written informed consent was taken. As per the assessment format all participants were assessed; included basic information about the subject, age, sitting hours, involvement in any physical activity, any history of LBP and knee ROM. Outcome measures were taken in form of popliteal angle using active knee extension test (AKE). It measures the knee extension angle once the hamstrings have been actively lengthened to end range, giving an indication of hamstring muscle length [10].

Specifically designed apparatus were used to measure the active knee extension for this investigation. Participants were in supine lying position on the table, facing the rectangular frame, and then Participant was asked to flex the tested limb until the thigh touched the rectangular frame, being at 90° with the table. Now therapist will use universal goniometer to measure the range lateral femoral condoyle was used as fulcrum, stable arm is over the thigh in direction to the greater trochanter and the moveable arm is over the leg in direction to the lateral malleolus. Now participant were asked to extend the knee until they perceive a powerful resistance over the posterior aspect of knee, without any prior warm-up, subjects were instructed to hold this position for few sec (2-3) goniometric reading was taken. The popliteal angle was measured by 180 minus the corresponding goniometric reading. Second examiner will stabilized the contralateral limb in fully extended position with the stabilizing belt.

After 1st reading participant were asked to take rest for few minutes (2-3) and then make participant ready for 2nd trial. The best reading was recorded after getting the range and popliteal angle was measured and recorded. 20 degree is normal value of, measurement i.e. popliteal angle. If the value is more than 20 degree from full knee extension indicates tightness of hamstring muscle [12]. The data was recorded and analyzed in excel sheet. Data was analyzed using SPSS version 23. Relationship between popliteal angle with sitting hours and physical activity was analyzed. P value <0.005 is considered as statistical significance level.

## 3. RESULTS

Total no. of subjects: 150

No. of Males: 28

No. of Females: 122

The mean value for age was 20.08.

The mean value for sitting hours was 8 hours a day.

Out of 150 students, 97 were not doing any physical activity where as 53 were involved in different types of physical activity which includes walking, gym, cycling and yoga. The average time for physical activity was 45 minutes.

## 5. DISCUSSION

The Popliteal angle was measured with active knee extension test by using universal goniometer. There are several studies which were using AKE test for measuring hamstring flexibility and they show that the AKE test shows excellent inter-ratter and intra-ratter reliability for assessing the hamstring muscle flexibility [11,13].

The total number of subjects undertaken for study was 150. Out of which 47 students had normal flexibility of hamstring whereas 103 students had tight hamstring. The mean value of popliteal angle of right side was 33.96 degree (range 10-65 degree) and left side was 32.63 degree (range 5-60 degree) as shown in Table 1. That indicates that most of the students have tightness of hamstring. One study says that maximum flexibility in both males and females is found in their younger age like in the twenties, and after 40s person generally adapts maximum tightness [7]. Contrary to this claim, present study found a significant reduction in flexibility in young population age range 18 to 23 years.

Present study found significant relation of hamstring tightness with more sitting hours as per Table 2. One study found 82% prevalence of hamstring tightness among college going students [14]. Populations who had prolonged sitting were selected as sample in that study. That can be a reason of the similarity in the result. Sitting position allows hamstring to go into shorten position as there is knee flexion and posterior rotation of pelvis. This shortened position further develops hamstring tightness and causes trigger points during prolong sitting. This in turn will increase pressure on lumbar disc ad increase mechanical loading on lumbar spine [2,11].

This study also found significant increase in hamstring tightness in people with less physical activity (Table 3). Present study includes 28 males and 122 females. In contrast to the present study, most of the literature supported the fact that females are more flexible than men in terms of hamstring flexibility [15]. Anatomical variation in the structure of joints especially hip and pelvis plays a role. Also men tend to perform more rigorous physical work that results in greater micro trauma [12,16].

**Table 1. Mean value of right and left popliteal angle**

| total N | Right | Left |
|---|---|---|
| 150 | 33.96 degree (range 10-65) | 32.63 degree (range 5-60) |

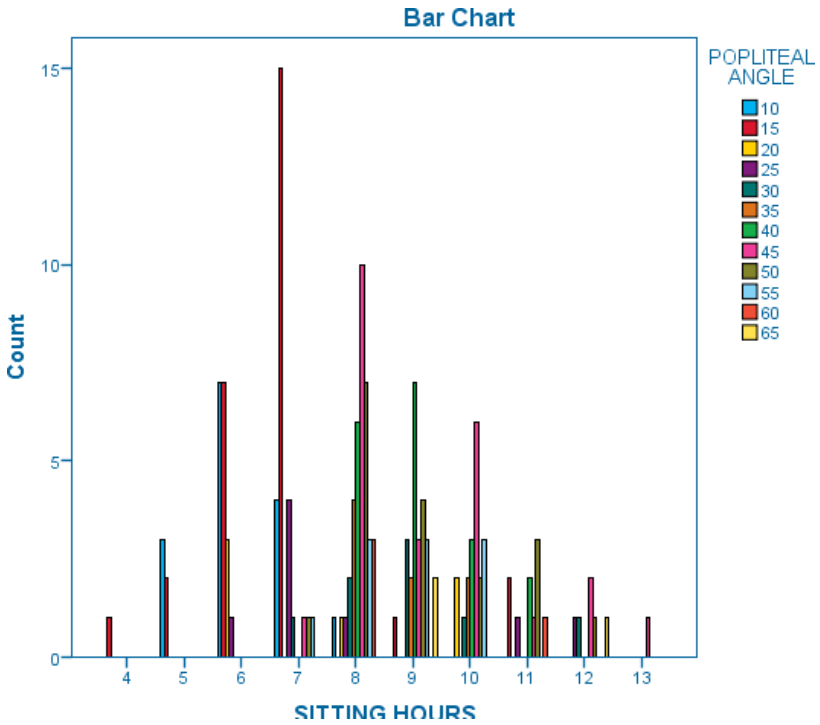


**Fig. 1. Relation of popliteal angle with sitting hours**

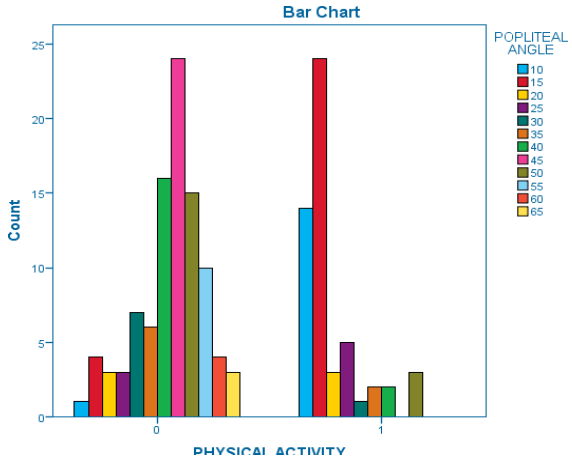


**Fig. 2. Relation of popliteal angle with physical activity**

**Table 2. Relation between popliteal angle and sitting hours using Pearson chi square test**

| | Value | Degree of freedom | P value |
|---|---|---|---|
| Pearson chi square test | 183.007 | 99 | .000* |
| Likelihood ratio | 191.950 | 99 | .000* |
| N of valid cases | 150 | | |

**p <0.005*

**Table 3. Relationship between popliteal angle and physical activity using Pearson chi square test**

| | Value | Degree of freedom | P value |
|---|---|---|---|
| Pearson chi square test | 87.545 | 11 | .000* |
| Likelihood ratio | 103.004 | 11 | .000* |
| N of valid cases | 150 | | |

**p <0.005*

Despite of many discrepancies compared to the literature, the study found tight hamstring in students possibly because of less physical activity and extended sitting hours of students [7].

## 6. CONCLUSION

Thus, present study concludes that students have reduced hamstring flexibility. Students who are having higher sitting hours tend to have more tightness. Also physical activity plays major role in hamstring tightness. Students who are active have fewer chances to develop hamstring tightness than students who are less active.

## CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

## ETHICAL APPROVAL

The ethical consideration for this observational study was considered by college committee. After taking approval, the study commenced.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES


1. Weerasekara I, Kumari I, Weerarathna N, Withanage C, Wanniarachchi C. The prevalence of hamstring tightness among the male athletes of university of peradeniya in 2010. J Palliative Care Med. 2013;1(108):2.
2. Cornbleet SL, Woolsey NB. Assessment of hamstring muscle length in school-aged children using the sit-and-reach test and the inclinometer measure of hip joint angle. Physical Therapy. 1996;76(8):850-5.
3. Carlson C. The natural history and management of hamstring injuries. Current reviews in musculoskeletal medicine. 2008;1(2):120-3.
4. Bellew S, Ford H, Shere E. The relationship between hamstring flexibility and pelvic rotation around the hip during forward bending. The Plymouth Student Journal of Health & Social Work. 2010: 19-29.
5. Fisk JW, Baigent ML, Hill PD. Scheuermann's disease. Clinical and radiological survey of 17 and 18 year olds. American Journal of Physical Medicine. 1984;63(1):18-30.
6. Barash HL, Galante JO, Lambert CN, Ray RD. Spondylolisthesis and tight hamstrings. JBJS. 1970;52(7):1319-28.
7. Feldman DE, Shrier I, Rossignol M, Abenhaim L. Risk factors for the development of low back pain in adolescence. American journal of epidemiology. 2001;154(1):30-6.
8. Fatima G, Qamar MM, Hassan JU, Basharat A. Extended sitting can cause hamstring tightness. Saudi Journal of Sports Medicine. 2017;17(2):110.
9. Thakur D, Rose S. A Study to Find Out the Correlation Between the Right and Left Hamstring Length in Both Genders to Determine the Prevalence of Hamstring Tightness Among College Students. Nitte university journal of health science. 2016;6(4):46.
10. Shepherd E, Winter S, Gordon S. Comparing hamstring muscle length measurements of the traditional active knee extension test and a functional hamstring flexibility test. Physiother Rehabil. 2017;2(01):2573-0312.
11. Neto T, Jacobsohn L, Carita AI, Oliveira R. Reliability of the Active Knee Extension Test and the Straight Leg Raise Test. Journal of Sport Rehabilitation.
12. Magee SD. Orthopedic Physical Assessment-E-Book Elsevier Health Sciences. 2014:74.
13. Hamid MS, Ali MR, Yusof A. Interrater and intrarater reliability of the active knee

extension (AKE) test among healthy adults. Journal of Physical Therapy Science. 2013;25(8):957-61.

14. Yadav Sk. Comparative Study Between the Effectiveness of Bowen Technique and Dynamic Soft Tissue Mobilization in Increasing Hamstring Flexibility (Doctoral Dissertation).

15. Kippers V, Parker AW. Toe-touch test: a measure of its validity. Physical Therapy. 1987;67(11):1680-4.

16. Kanishka GK, Sandamali H, Weerasinghe I, Binduhewa L, Dilshara C, De Silva C, Silva D, Balasuriya A. Prevalence of hamstring tightness and associated factors among sewing machine operators. Ceylon Journal of Medical Science. 2019;56(1).



*Peer-review history:*
*The peer review history for this paper can be accessed here:*
*https://www.sdiarticle4.com/review-history/71770*