

Correlation Between Hamstring Muscle Tightness and Prolonged Standing Occupation among Young Adults Across Ahmedabad City

Dr Dhvani Gandhi¹, Dr Amit Patel²

¹First year MPT Student, JG College of Physiotherapy, Ahmedabad, Gujarat.

²Senior Lecturer and PG Guide (MPT Orthopaedics), JG College of Physiotherapy, Ahmedabad.

Corresponding Author: Dr Dhvani Gandhi

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ABSTRACT

BACKGROUND AND NEED OF STUDY: Hamstring tightness is common issue among young adults, often leading to decreased flexibility and higher risk of injury, particularly in individuals who are physically active. Prolonged standing period can be very harmful for the musculoskeletal health, including hamstrings tightness. Undue stress can affect musculotendinous units thus predisposing muscle to abnormal length i.e. shortened or lengthened which eventually cause tightness.

AIMS AND OBJECTIVES: The aim of this study is to investigate correlation between hamstring tightness and prolonged standing occupation among young adults across Ahmedabad city.

METHODOLOGY: A correlational study was conducted to investigate the correlation between Hamstring tightness and prolonged standing occupation among age group 18-25 years. Total of 40 participants who met inclusion criteria were recruited. Hamstring's flexibility was assessed via Active knee extension test while occupational standing duration was noted in demographic data sheet for each patient.

RESULT: Data of study showed no normal distribution; hence spearman test was applied for statistical analysis. Result shows moderate negative correlation between prolonged standing hours and active knee extension scores ($r=-0.660$ $p<0.01$) which indicates significant hamstring tightness.

CONCLUSION: The study shows a negative correlation between prolonged standing hours and active knee extension range which indicates significant hamstring tightness.

Keywords: Hamstring tightness, prolonged standing, young adults, active knee extension test.

INTRODUCTION

Hamstring tightness is a common condition that affects people of all ages, with young adults experiencing it particularly frequently. This condition demands a comprehensive understanding of the hamstring anatomy, which includes the semitendinosus, semimembranosus, and

biceps femoris muscles.^[1] These muscles play a crucial role in knee flexion and hip extension, but their biarticular structure—spanning two joints—and high proportion of type II fibers make them especially vulnerable to injury. The clinical manifestation of hamstring tightness is often identified by the inability to extend the knee

beyond a specific angle during hip flexion, a condition that is not limited to any specific demographic. Its prevalence is observed across all age groups, with a higher incidence reported in females. Sports that involve sudden acceleration and quick direction changes are linked to increased risk of hamstring tightness.^[2] The effect of hamstring tightness go beyond the musculoskeletal system, contributing to conditions such as lumbopelvic issues. This tightness can lead to alterations in posture and pelvic region mechanics, increasing the risk of various injuries including hamstring strains, low back pain, and patellofemoral pain syndrome.^[3] The physiological basis for this tightness can be attributed to factors like muscle overuse, poor posture, and participation in certain sports activities, which contribute to conditions like hamstring syndrome and back pain.^[4] It can also affect postures of students who had long sitting hours. It can also affect the professionals that have long standing hours. It can affect people with low back pain. On the contrary, a hamstring in good form makes it easier for everyone to effectively perform the ADL's.^[5] Prolonged standing can also affect hamstrings flexibility.^[6] Static postures when adopted for prolonged periods predispose the body to overuse syndrome, which can be very harmful for the musculoskeletal health. In order to avoid such health problems, people should be educated to adopt healthy postures. During prolonged standing, abnormal length of hamstrings i.e. shortened or lengthened may cause the pelvis to rotate abnormally. For example, during standing, shortened or tight hamstrings cause the pelvis to rotate backwards, leading to posterior pelvic tilt. While a lengthened hamstring causes the pelvis to rotate anteriorly leading to anterior pelvic tilt. Both these abnormal postures make the hamstrings less flexible, inducing a feeling of tightness.^[7] This study aims to correlate prolonged standing hours with hamstring tightness among young adults' population.

MATERIALS & METHODS

Study design: Cross-sectional
Study setting: Ahmedabad
Participants: Young adults
Sample size: 40
Duration of study: 1 month

INCLUSION CRITERIA

Age group 18 – 25.
Both male and female.
Involving 4 hours or more prolonged standing.
Willing to participate

EXCLUSION CRITERIA

Pre-existing musculoskeletal disorders or neurological condition.
Recent lower limb injuries or surgeries.
Regular participation in physical therapy or high intensity sports programs.

MATERIALS

Plinth
Goniometer
Pen
Paper

PROCEDURE

Active knee extension test (AKE test) is used to assess Hamstring tightness. Participants were asked to lie in the supine position on a plinth while keeping extension in both lower limbs. Pillows were used to adjust both the anterior superior iliac spines. The untested lower limb was secured to the plinth with one examiner by putting her hands over the lower third of the thigh. The participants were asked to flex the hip and knee to 90° until the thigh and leg came in contact with the pillows. Another examiner asked participants to raise their knee in extension position as much as possible and maintain it for approximately 5 seconds while keeping the foot relaxed. The joint axis was marked for the placement of a universal goniometer with its arms fixed parallel to the femur and tibia. The examiner instructed the participant to point their toes downward and keep a relaxed plantar-flexed position. So, the pressure on the neural

structures in the posterior aspect of the lower limb is decreased and the gastrocnemius passive insufficiency is avoided. The measurement of this test was known as the knee flexion degree from the last knee extension. Each knee angle was measured three times, with 1 minute rest between trials, calculating the mean to use it for the analysis of the AKE test.^[8]

OUTCOME MEASURE

The Active Knee Extension Test is taken as an outcome measure which is used to assess hamstring muscle length and the range of active knee extension in the position of hip flexion. The interrater reliability, measured using intraclass correlation coefficients (ICC_{2,1}) was found to be 0.87 for the dominant knee and 0.81 for the nondominant knee. Furthermore, the intrarater (test-retest) reliability ICC_{3,1} values ranged from 0.78 to 0.97 and 0.75 to 0.84 for raters 1 and 2 respectively.^[9]

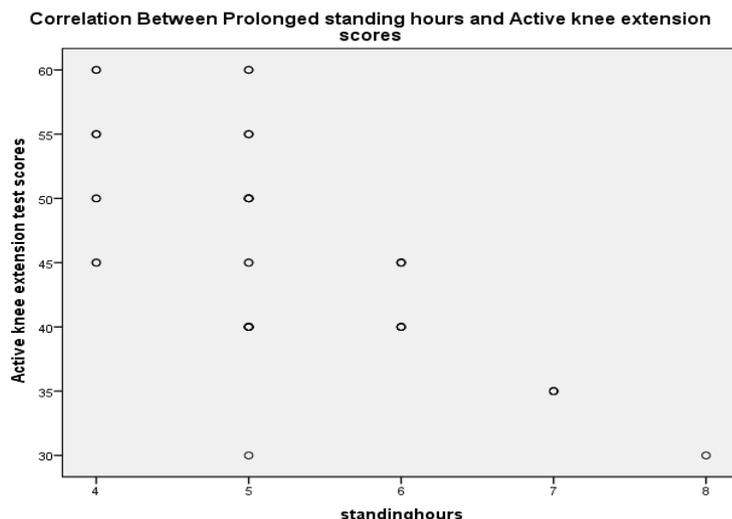
STATISTICAL ANALYSIS

Total 40 participants were included in this study. Statistical Analysis of 40 participants

was carried out using SPSS version 20 and Microsoft Excel 2011. Spearman correlation test was applied to find out the relationship between hamstring muscle tightness and prolonged standing hours. Level of Significance was kept at $p < 0.01$.

RESULT

The study population comprises of 40 young healthy individuals of age group 18-25 years. Hamstring muscle tightness was assessed using Active Knee Extension test (AKE test). The distribution of each variable was analysed using Shapiro-wilk test as the sample size was less than 50, for the test of normality. Active knee extension scores follow normal distribution but standing hours does not follow normal distribution. Hence, spearman correlation test (2 tailed) was applied to find the correlation between the two components. There was a moderate negative correlation between hamstring muscle tightness and prolonged standing occupation at $r = -0.660$ which was statistically significant at $p < 0.01$.



DISCUSSION

The study was conducted to see the prevalence of hamstrings tightness and its effects on lower extremity function in asymptomatic people that involves prolonged standing hours and the population

of nurses was chosen. Data were collected using tools such as LLTQ, AKE, SLR, the results were collected from three big hospitals of the city and then analyzed with the help of SPSS version 25. The results shown that out of a sample size of 65, 10

subjects were reported with bilateral hamstring muscle tightness (with a mean age of 30-35 years) following functional limitations while 55 subjects were reported with no present hamstrings tightness. This indicates that 15.38% of the participants had bilateral hamstring tightness, whereas 84.62% did not show any significant tightness. These results suggest that prolonged standing hours do not affect the flexibility of hamstrings muscles. Prolonged standing is not the only reason for hamstrings tightness subjects with hamstrings tightness.^[10] A study conducted on college going students to see if they have tight hamstrings. 100 subjects aging 18-25 years were taken involving both genders. Sit and reach test was performed and results showed that male participants with a mean age of 21 years have 27.5% severe tightness in left hamstrings muscle while female participants with an average age of 19 years exhibited 44% prevalence of right sided hamstring tightness. The prevalence of tight hamstrings is higher in female participants than in male participants. But the results of the recent study showed that the prevalence of hamstrings tightness among asymptomatic participants with prolonged standing hours is low.^[11] Gurpreet Kaur and M Kashif Reza showed that limited flexibility has been shown to predispose a person to several musculoskeletal overuse injuries and also significantly affect a person's functional level.^[12] In a study, Yadav R. explained that tight hamstrings can lead to soft tissue injuries, meniscal damage, knee pain, chondromalacia patella, and poor posture. Changes in hamstring flexibility can cause significant postural alterations and impact the function of both the hip joint and lumbar spine. Hamstring injuries are common during high-speed or high-intensity activities and have a high recurrence rate. Among athletes, limited hamstring flexibility is identified as a major contributing factor to such injuries.^[13] Reid et al., (2010) in a review of several published researches on occupational postures and lower extremity involvement

led to the development of a discomfort guideline for prolonged standing, based on existing evidence. Standing for more than 2 hours per session was found to impact the hip, while standing over 3 hours affected the entire lower extremity.^[14] Halim and Omar (2012) developed the Prolonged Standing Strain Index (PSSI) to evaluate risk levels linked to standing occupations and workplace conditions such as posture, injuries, vibration, and air quality, while recommending minimum acceptable risk thresholds. The PSSI generates a numerical score; that categorizes a specific job's risk level as "Safe," "Slightly unsafe," or "Unsafe" category.^[15] McCulloch (2002), reviewed and analyzed 17 studies that involved standing for more than 8 hours per day and identified major health risks, such as preterm birth, chronic venous insufficiency, lower back and foot musculoskeletal pain, and spontaneous abortions.^[16]

CONCLUSION

The findings of this study demonstrate a moderate negative correlation between prolonged standing hours and active knee extension scores, suggesting that individuals who spend extended periods standing tend to exhibit greater hamstring tightness. This inverse relationship indicates that as the duration of standing increases, the flexibility of the hamstring muscles decreases, leading to reduced active knee extension ranges.

Declaration by Authors

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