

Prevalence of Hamstrings Tightness Using Active Knee Extension Test among Diamond Assorters

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Abstract

Background: Hamstrings is a key component of flexibility in the human body. People involved in certain occupation are more prone to develop hamstrings tightness. It is defined as the inability to achieve more than 160 degrees of knee extension when the hip is flexed to 90 degrees. This study aimed to find out prevalence of hamstrings tightness among diamond sorters.

Method: A descriptive cross sectional study was carried out among 150 diamond sorters. Demographic data was collected and active knee extension was used to measure the hamstrings tightness among the diamond sorters. Descriptive analysis was done by using Microsoft Excel version 2010.

Conclusion: Prevalence of hamstrings tightness is very high in diamond sorters. 95.3% subjects were found to have hamstrings tightness in right limb and 94% subjects were found to have hamstrings tightness in left limb. Proper ergonomic arrangements and healthy working conditions are recommended to prevent musculoskeletal disorders.

Keywords: Active knee extension test, diamond sorters, hamstring tightness, popliteal angle, prolonged sitting.

Introduction

Flexibility has been defined as the ability of a muscle to lengthen and allow one joint (or more than one joint in a series) to move through a range of motion.¹ It is a physical fitness attribute and is often evaluated from the joint range of motion,² an essential element of normal biomechanical functioning in sports and daily living activity.³ Hamstring is a group of three muscles, semitendinosus, semi membranous and biceps femoris, which makes up the posterior compartment of

the thigh. They are the major knee flexors and also aid in hip extension. Physiologically full stretch occurs in this muscle only if the knee is fully extended and hip fully flexed.⁴ Complete contraction occurs when the knee is fully flexed and hip is fully extended. Complete contraction and stretching rarely occurs in normal daily activity and hamstrings are therefore rarely put through their full physiological amplitude. Therefore, chance of it going into tightness are more in individuals not participating in any daily stretching routine.⁵

Muscle tightness is caused by the decreased ability of the muscle to deform and results in a decreased range of motion at the joint on which it acts.⁶ It is found that the prevalence of hamstring tightness among students is high.⁷ It is a common condition even among young healthy individuals and recreational athletes. Muscle length, hamstring strength, strength ratios, demographic characteristics, history of previous injury, lack of flexibility, muscular control and inadequate warm up are some common causes for hamstring strain.⁸ It remains

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a primary concern for rehabilitation professionals as they result in a debilitating injury characterized by acute loss of functional performance, prolonged periods of recovery, and resultant increased incidence of recurrence. Limited flexibility causes neuro-musculoskeletal symptoms. These musculoskeletal symptoms may lead to decrease in strength, stability, endurance and much more.⁶ Decreased hamstring flexibility is a risk factor for the development of patellar tendinopathy and patello-femoral pain syndrome.² Tightness in hamstring muscle causes posterior pelvic tilt which leads to decrease in lumbar lordosis resulting in low back pain and gait abnormality.⁷

The diamond trading profession includes; diamond mining, diamond cutting, diamond polishing, diamond assortment, and diamond selling.⁹ Assorters are required to work around 8-10 hours a day for 6 days a week with limited interval periods. The main work of diamond assorters is to segregate the diamonds according to the cut, color, and clarity for further sell. The position attained by them is mostly sitting. Their profession demands various physical activities like repetitive/sustained movements, prolonged sitting in awkward posture, exposure to vibrations leading to various mechanical stresses on various parts of body like neck, upper and lower back, knee, elbow, wrist or hand and fingers.¹⁰ The prolonged sitting hours can affect flexibility of soft tissues, especially two joint muscles. In prolonged sitting, constant shortened position develops hamstring trigger points and cause muscle tightness.¹¹

Hamstring tightness maybe measured using the active unilateral SLR test,¹² the passive unilateral SLR test,¹³ the sit and reach test,¹⁴ and the active knee extension test (AKET).¹⁵ The AKET measures hamstring tightness by the angle subtended by knee flexion after a maximum active knee extension, with the hip stabilized at 90 degrees. Hamstring muscle tightness is defined as Knee Extension Angle (KEA) greater than 20 degrees where KEA is the degree of knee flexion from terminal knee extension.¹⁶

The aim of the study was to find out the prevalence of hamstring tightness among diamond assorters who have long sedentary hours of sitting as a part of their profession. This study will help to create awareness about

the lack of normal flexibility maintenance, especially among professions involving prolonged sitting.

Methodology

A descriptive observational study was carried out among total 150 Diamond Assorters from Maruti Exports in and Harikrishna Diamonds in Surat with convenient sampling method. Participants were selected according to inclusion and exclusion criteria. All the participants agreed and signed informed consent form to extend full co-operation for data collection.

Inclusion criteria included diamond assorters of age 25 to 50 year having more than 7 working hours in sitting position. Individual with any musculoskeletal and neurological impairment, any structural deformity, any trauma or surgical procedure of hip and knee in past 6 months were excluded from study. Purpose of the study was explained to the participants. Preliminary measurements and demographic data including age, gender, height and weight were collected. Active Knee Extension Test was used as a test to measure hamstring flexibility level. Degree of popliteal angle was measured in both lower quadrants bilaterally as an outcome measure.

Active Knee Extension test: This test was selected based upon established criteria and its high test-retest validity¹⁵. Materials used were pen, paper, plinth (bed) and Universal goniometer. The subject lay supine on a plinth with their right knee and hip flexed to 90°. They monitored the position of the femur with their hand, and were instructed not to allow the femur to move away from the hand at any point during the test. The participants were instructed to extend their right leg as far as possible; keeping their foot relaxed and hold the position for 5 seconds. Each participant performed a single repetition of the movement to familiarize themselves with the action. A second repetition was performed and at the end of the 5 second holding period the angle of knee extension was measured. The center of the goniometer was positioned over the axis point previously marked on the lateral joint line, and the goniometer arms were positioned along the lines marked on the femur and fibula. Same was performed in left lower limb.¹⁷

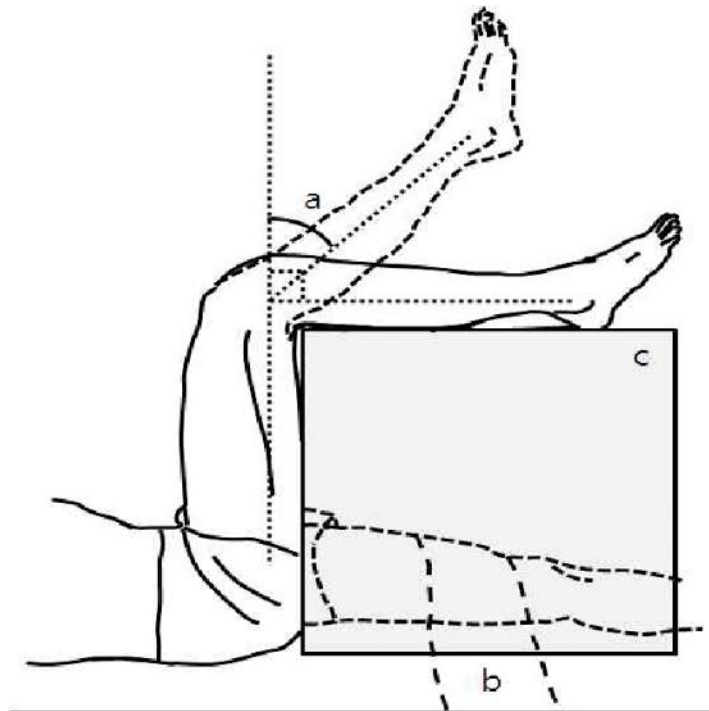


Fig 1: Measurement of popliteal angle

Statistical Analysis and Results: The data was analysed in Microsoft excel 2010. Prevalence of hamstring muscle tightness using active knee extension test was calculated. The mean age of the participants was 35.98 ± 7.98 years.

Table 1 represents mean and standard deviation of popliteal angle of both lower limbs.

Table 1: Mean and standard deviation of popliteal angle of both lower limbs

	Degree of popliteal angle in Right limb	Degree of popliteal angle in left limb
Mean	38.23	39.38
Standard deviation	11.09	11.26

Table 2: Prevalence of hamstring tightness

Degree of popliteal angle	Right lower limb	Left lower limb	Bilateral
0-20	9(6%)	7(4.66%)	6(4%)
20 and more	141(94%)	143(95.33%)	140(96%)

Table 2 shows that 94% of the subjects had hamstring tightness in their right lower limb, 95.33% of the subjects had hamstring tightness in their left lower limb and 94% of the subjects had hamstring tightness in bilateral lower limb.

Table 3 shows that 6% and 5% subjects had popliteal angle between 0-20° in right and left limbs respectively. 53% and 46% subjects had popliteal angle between 21-40° in right and left limbs respectively. 39% and 48% subjects had popliteal angle between 41-60° in right and left limbs respectively. 2% and 1% subjects had

popliteal angle between 61- 80° in right and left limbs respectively.

Table 3: Severity of hamstring tightness

Degree of popliteal angle	No. of subjects (right limb)	No. of Subjects (left limb)
0-20	9 (6%)	7 (5%)
21-40	80 (53%)	70(46%)
41-60	58(39%)	72(48%)
61-80	3(2%)	1 (1%)
Total Participants	150	150

Discussion

The objective of the study was to find out the prevalence of hamstring tightness in diamond assorters in Surat and the results show that 96% of subjects have bilateral hamstring tightness. The mean of age of the participants was 35.98 years and the standard deviation was 7.98. 35% of the participants were of age between 25-30 years, 18% of them were of age between 31-35 years, 17% of them were of age between 36-40 years and 46-50 years and 13% of them were of age between 41-45 years. The mean of degree of popliteal angle in right limb of the participants was 38.233 and the standard deviation was 11.09 and the mean of degree of popliteal angle in left limb of the participants was 39.38 and the standard deviation was 11.267. 6% and 5% participants had 0-20° of popliteal angle in right and left limbs respectively. 53% and 48% participants had 21-40° of popliteal angle in right and left limbs respectively. 39% and 54% participants had 41-60° of popliteal angle in right and left limbs respectively. 2% and 1% participants had 61-80° of popliteal angle in right and left limbs respectively. Out of 150 diamond assorters, 94% subjects were found to have hamstring muscle tightness in right limb and 95.33% subjects were found to have hamstring muscle tightness in left limb. From this study over all prevalence of hamstring tightness is high.

Sedentary work nature is a major risk factor across a spectrum of preventable diseases that lower the quality of life. Sedentary work habits can lead to various problems like tightness of muscle, decreased joint range of motion, decreased flexibility, further adding discomfort and hampering daily activities of an individual. In the seated position, hamstring is held at shortened position due to knee flexion and posterior pelvic rotation. In prolonged sitting, this constant shortened position develops hamstring trigger points and cause muscle tightness.¹⁸ Further, seated position increases the pressure on lumbar intervertebral disc. Therefore, prolonged sitting can increase the mechanical stress on lumbar spine.¹⁹ Furthermore, frequent forward bending increase the mechanical stress on the spine with people having hamstring tightness.²⁰

Reduction in hamstrings flexibility has been found to be one of the causes for development of low back pain. Hamstring muscle tightness leads to decrease range of motion of lumbar flexion and pelvic tilt.²¹ This can alter the biomechanics of lumbar spine and may lead to back pain. Stiffness of one muscle group can cause

compensatory movement at an adjoining joint that is controlled by muscles or joints with less stiffness.²² A study suggested Patello-femoral pain syndrome due to lack of hamstring flexibility. Prolonged sitting can be a contributory factor in hamstring tightness.²³

This study was conducted only on diamond assorters of Surat with age group of 25 to 50 years thus limiting the generalization of these results. Further studies with a large number of subjects will help to generalize the findings. Moreover, severity of prolonged sitting and its correlation with musculoskeletal disorders should be assessed in further studies.

Conclusion

Prevalence of hamstring tightness is very high among diamond assorters (95.3% in right side and 94% in left side.) It is recommended that healthy working conditions must be provided which can make the work easier and more relaxed.

Conflict of Interest: There is no Conflict of Interest.

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Ethical Approval: Yes

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