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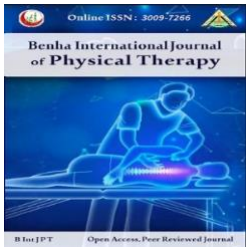

Original research

Prevalence of Hamstring Tightness Among Physical Therapy Students at Benha University

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Abstract

Background: Hamstring tightness, marked by reduced extensibility, is common among university students. Several risk factors contribute to this, such as prolonged sitting during lectures. **Purposes:** to find out how common hamstring tightness is among Benha University physical therapy students and investigate how it relates to limb side, gender, and body weight. **Methods:** A cross-sectional investigation was carried out on 220 students (110 males, 110 females). Hamstring flexibility was assessed utilizing a digital goniometer and the Active Knee Extension (AKE) test. **Results:** Hamstring tightness was highly prevalent in the study population, with 69.1% of participants showing tightness in the right hamstring and 74.5% in the left. Most participants experienced mild tightness in the right hamstring (39.1%) and in the left hamstring (38.6%). No significant association was found between gender and tightness (right: $p = 0.24$; left: $p = 0.76$) or between limb side and tightness. Weight class showed no association with right hamstring tightness ($p = 0.09$) but was significantly associated with left hamstring tightness, with higher prevalence in overweight/obese participants ($p = 0.001$). **Conclusion:** The frequency of hamstring tightness in students pursuing physical therapy was found to be notably high. Hamstring tightness was comparable between both sides, with mild tightness being the most frequently reported grade on both sides. Overweight and obese individuals exhibited a higher incidence of left-sided hamstring tightness compared to those with normal or low body weight.

Keywords: Active knee extension test,Flexibility,Hamstring muscle shortening.

Introduction

The incapacity of a muscle to move a joint over its whole range of motion (ROM) is known as muscular tightness this is due to reduced extensibility, which can cause pain, limit flexibility, and impair performance [1,2].Tight hamstrings may tilt the pelvis backward, flatten the lumbar spine, and contribute to postural problems such as sacroiliac joint pain, while also restricting blood flow and muscle efficiency [3].

The modern sedentary lifestyle is a major contributor to postural abnormalities. In many educational environments, extended periods of sitting can significantly reduce the flexibility of soft tissues, particularly in muscles with multiple attachment points [4]. Undergraduate students often spend long periods sitting, promoting

musculoskeletal imbalances such as posterior pelvic tilt and decreased lumbar lordosis [5]. Hamstring muscle originates from ischial tuberosity and inserts in tibia and fibula [6] so sitting for long time with the lumbar spine flexed, the pelvis posteriorly tilted, and the knees flexed puts the hamstring in shortened position by approximating the proximal and distal attachments of hamstring resulting in decreased hamstring extensibility and sustained hamstring tightness [7].

These findings may suggest a physiological adaptation involving passive muscle stiffness. Alterations in passive stiffness or muscle length can arise through various mechanisms, such as a reduction in the number of sarcomeres arranged in series [8] or modifications in the mechanical properties of connective tissue [9].

However, it has not been investigated how often hamstring tightness is among Benha University physical therapy students.

Factors such as gender and BMI may influence flexibility. While many studies report greater flexibility in females [10], others, such as Perveen et al.[11], found the opposite. Similarly, evidence on BMI is inconsistent, with some studies finding no association [12] and others reporting a negative correlation [13].

Several clinical tests have been developed to assess hamstring tightness, including the passive knee extension test, active knee extension test, passive straight leg raise test, sit and reach test, the V-sit and reach test, back saver sit and reach test, toe touch test and insolated hamstring flexibility test [14–18]. Among available assessment tools, the AKE test is widely recognized as a gold standard for evaluating hamstring flexibility in research context [19].

Patients and Methods

This study was carried out at Benha University's Faculty of Physical Therapy between January and May of 2025. The faculty of physical therapy's research ethics committee gave its approval to the study protocol (NO: P.T.REC/012/005848) .

Sample size calculation

The sample size was calculated using the formula $n = z^2p(1–p)/d^2$ based on the prevalence of hamstring tightness reported by Naqvi et al. [20], with a 95% confidence level ($\alpha = 0.05$) and effect size of 0.064. The minimum required sample was 200, increased to 220 to allow for a 10% dropout rate.

Subjects of the study

Two hundred and twenty Egyptian physical therapy students, (110 males and 110 females) were selected from Benha University. The study employed a straightforward sampling approach to find volunteers .

Males and females between the ages of 18 and 25 who could comprehend and adhere to spoken instructions met the study's inclusion requirements. In order to account for age-related variability in muscle flexibility and function, this age group was chosen to mimic the usual college student population.

Participants were excluded if they had systemic diseases; hamstring injury within the past two years; prior knee injury, spinal or lower limb fractures or surgery; congenital deformities; or leg length discrepancy >2 cm. Additional exclusions included acute hamstring spasm, pregnancy, neuromuscular disorders (e.g., stroke, muscular dystrophy, peripheral neuropathy), malignancy, infectious disease, or any spinal/limb deformity [21,22].

Assessment procedure

A total of 220 physical therapy students participated. All assessments were performed by the same physiotherapist. Eligible participants, screened according to inclusion criteria, received verbal and written information about the study, and informed consent was obtained in line with the Declaration of Helsinki. Demographic data and AKE angles were recorded on standardized forms and analyzed.

1) Assessment of weight and body mass index

Additionally, demographic information was documented, including height, weight, sex, and age. Both height and weight were measured using a single, uniform scale. Then, using the conventional calculation, Body Mass Index (BMI) was determined: BMI = weight (kg) / height² (m^2).

2) Assessment of Hamstring Flexibility

The Active Knee Extension test was used to measure hamstring flexibility. Participants stretch both legs while lying supine on a plinth; the non-tested limb was secured across the thigh and anterior superior iliac spine to stabilize the pelvis.

The tested hip was actively flexed to 90°, and participants used their hands to maintain femoral position [22].

A digital goniometer measured the AKE angle. Its stationary arm was fixed to the thigh with a Velcro strap, centered at the lateral joint line, and aligned parallel to the femur and tibia. The movable arm followed leg motion. Participants extended the right leg as far as possible with the foot relaxed in plantar flexion to reduce neural tension and gastrocnemius influence [21], holding the position for five seconds. The AKE angle was then recorded [23].

After completing a practice trial, each participant took the test three times. The degree of knee flexion at end-range extension was used to measure hamstring flexibility (Figure 2). Normal angles were less than 20°, mild tightness was indicated by 21–30°, moderate tightness by 31–40°, and severe tightness by >40°. The final score was calculated as the average of the three trials [24].

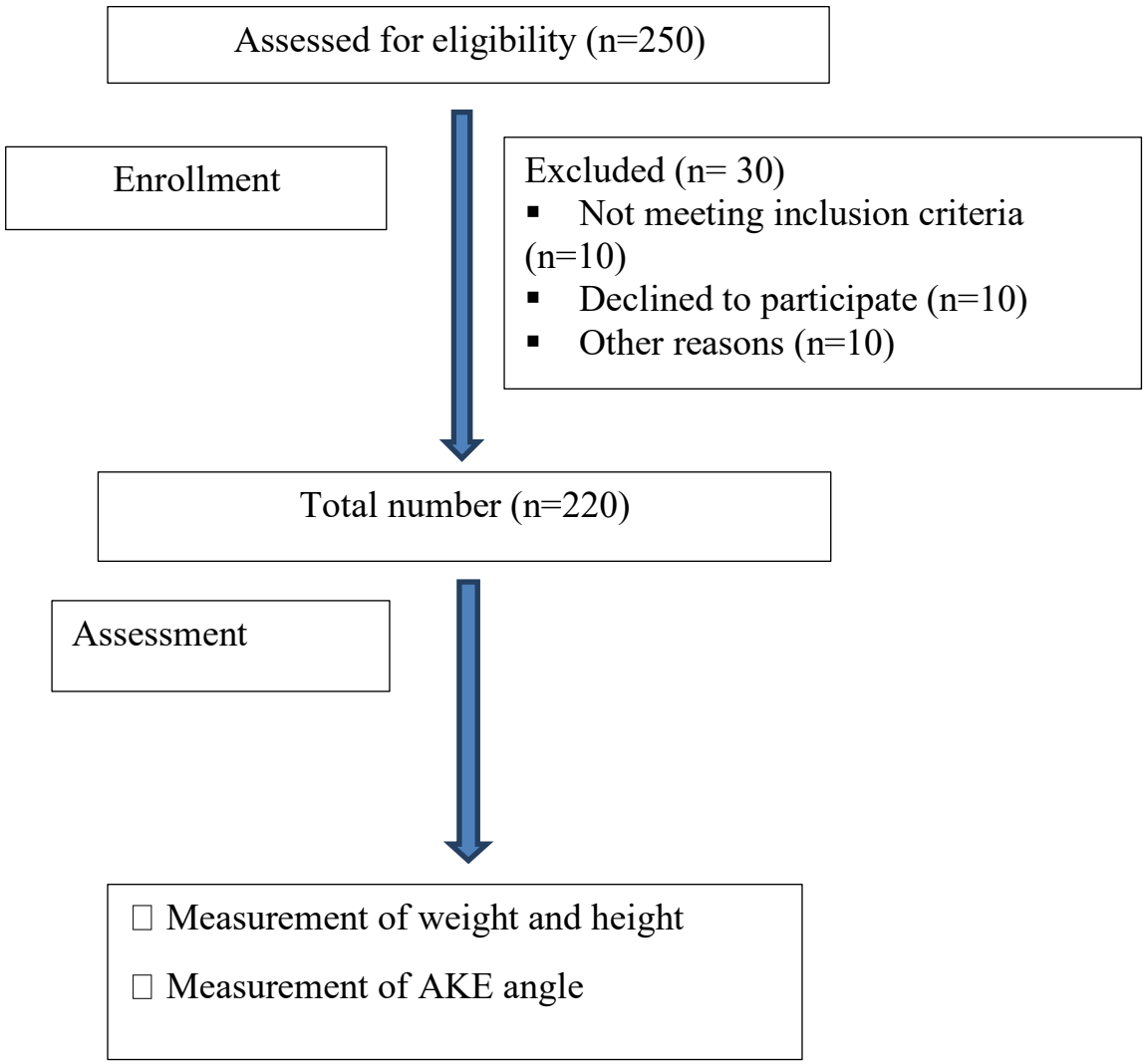

Fig. (1) participant flow chart

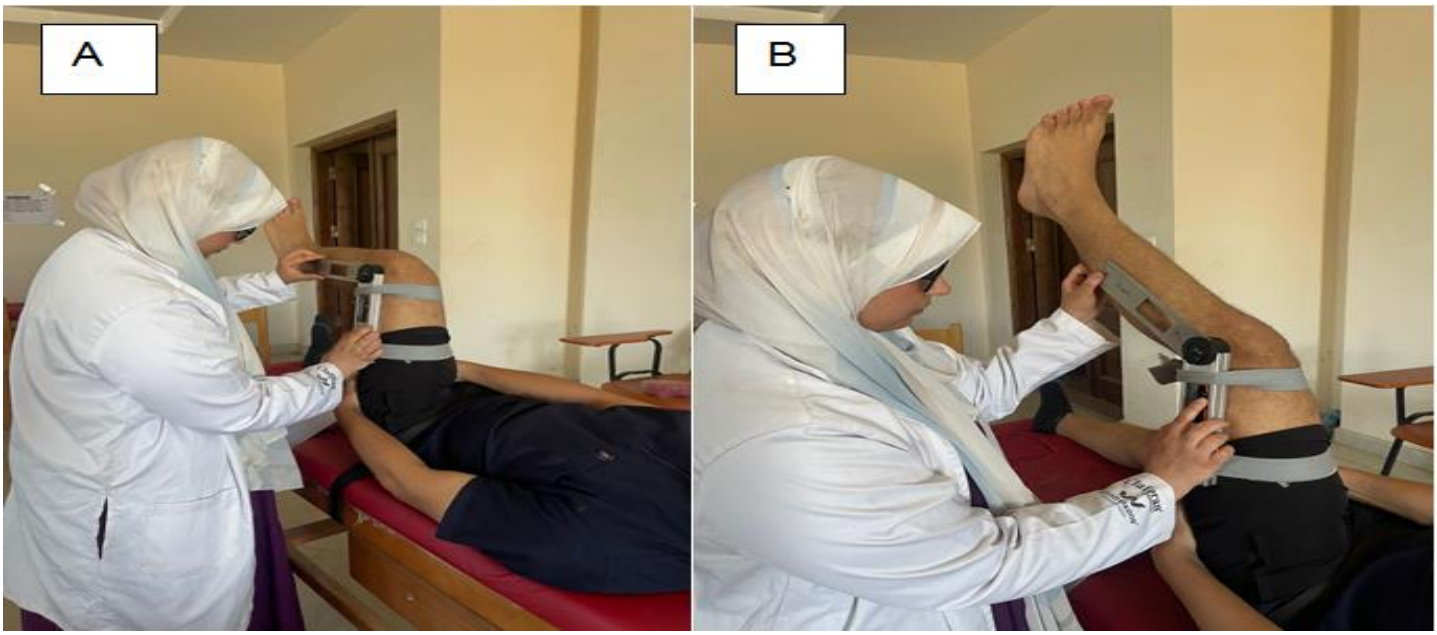

Fig. (2): Measurement of active knee extension angle; (A) starting position and (B) end position.

Statistical analysis:

The measured variables were presented using descriptive statistics, which included mean, standard deviation, minimum, maximum, and frequency. The relationship between hamstring tightness and weight classes and gender was examined using the chi-squared test. The purpose of McNemar's test was to examine the relationship between hamstring tightness and limb side. For every statistical test, the significance threshold was set at $p < 0.05$. The statistical program for social sciences (SPSS) version 25 for Windows was used to conduct all statistical analyses.

Results

A total of 220 physical therapy students at Benha university participated in this study, comprising 110 males (50%) and 110 females (50%). The mean age of the participants was 20.42 ± 1.06 years, ranging from 18 to 23 years. The mean weight was 67.29 ± 10.30 kg (range: 45-90 kg), mean height was 169.50 ± 9.04 cm (range: 152-188 cm), and BMI was 23.37 ± 2.74 kg/m² (range: 16.53-33.20 kg/m²).

Most participants were within the normal weight range, with 157 (71%) individuals. 51 (23%) were classified as overweight, while 8 (4%) were underweight, and 4 (2%) were categorized as obese, (Table 1).

The mean knee extension angle was 25.68 ± 9.54 degrees for the right limb and 27.19 ± 9.12 degrees for the left limb, with ranges of 4.97-60.22 and 10.90-51.67 degrees, respectively.

Hamstring tightness was observed in 152 participants (69.1%) on the right side and in 164 participants (74.5%) on the left side. Regarding the severity of tightness, the right hamstring was classified as normal in 68 participants (30.9%), mild in 86 (39.1%), moderate in 49 (22.3%), and severe in 17 (7.7%). For the left hamstring, 56 participants (25.5%) showed no tightness, 85 (38.6%) had mild tightness, 54 (24.5%) had moderate tightness, and 25 (11.4%) exhibited severe tightness, (Table 2).

Association between hamstring tightness with gender, weight, and limb side:

There was no significant association between hamstring tightness with gender, and limb side ($p > 0.05$). Left hamstring tightness was significantly associated with weight classification, showing a higher prevalence among overweight and obese participants as opposed to those who were underweight or of normal weight ($p < 0.001$; Ta

Table 1. Participant characteristics

	Mean ± SD	Minimum	Maximum
Age (years)	20.42 ± 1.06	18.00	23.00
Weight (kg)	67.29 ± 10.30	45.00	90.00
Height (cm)	169.50 ± 9.04	152.00	188.00
BMI (kg/m²)	23.37 ± 2.74	16.53	33.20
Sex distribution, N (%)			
Males	110 (50%)		
Females	110 (50%)		
Weight classes, N (%)			
Underweight	8 (4%)		
Normal weight	157 (71%)		
Overweight	51 (23%)		
Obese	4 (2%)		

SD, Standard deviation

Table 2. Prevalence of hamstring tightness in study group

	Mean ± SD	Minimum	Maximum
Knee extension angle (degrees)			
Right knee	25.68 ± 9.54	4.97	60.22
Left knee	27.19 ± 9.12	10.90	51.67
Hamstring tightness, N (%)			
Right hamstring	152 (69.1%)		
Left hamstring	164 (74.5%)		
Degree of tightness			
Right hamstring, N (%)			
Normal	68 (30.9%)		
Mild	86 (39.1%)		
Moderate	49 (22.3%)		
Sever	17 (7.7%)		
Left hamstring, N (%)			
Normal	56 (25.5%)		
Mild	85 (38.6%)		
Moderate	54 (24.5%)		
Sever	25 (11.4%)		

SD, Standard deviation

Table 3. Association between subject characteristics with hamstring tightness

	Right hamstring		χ^2	p -value	Left hamstring		χ^2	p -value
	Tight	Not tight			Tight	Not tight		
Gender								
Males	72 (65.5%)	38 (34.5%)	1.36	0.24	81 (73.6%)	29 (26.4%)	0.09	0.76
Females	80 (72.7%)	30 (27.3%)			83 (75.5%)	27 (24.5%)		
Weight classes								
Under/normal weight	109 (66.1%)	56 (33.9%)	2.83	0.09	113 (68.5%)	52 (31.5%)	12.77	0.001
Overweight/obese	43 (78.2%)	12 (21.8%)			51 (92.7%)	4 (7.3%)		
Limb Side								
Right side	152 (69.1%)	68 (30.9%)	2.33	0.13				
Left side	164 (74.5%)	56 (25.5%)						

χ2 : Chi squared value; p value: Probability value.

Discussion

According to this study, the majority of individuals had minor hamstring tightness in both their left and right hamstrings, and hamstring tightness was more prevalent among physical therapy students. Physical therapy students often maintain a baseline level of musculoskeletal conditioning, which helps prevent severe muscle shortening [25,26]. However, long-term sedentary behavior like sitting for lengthy periods of time during lectures or study sessions can cause mild muscular tightness by encouraging the hamstring muscles to shorten adaptively, which explains the research's findings [27–29].

This is supported by the findings of [30], who used the AKE test to examine the frequency and intensity of hamstring tightness in college students. According to their findings, hamstring stiffness was quite common among students between the ages of 18 and 25. Similarly, [31] who used the AKE test to measure hamstring tightness in college students who were physically active and those who were not, and it revealed a significant prevalence within the same age range. Conversely, [2] found that when nursing students were evaluated using the 90-90 Straight Leg Raise (SLR) exam, hamstring stiffness was not very common. This discrepancy may be attributed to differences in the studied populations. Furthermore, [32], who evaluated hamstring muscle length using sit-and-reach test, and reported a moderate prevalence of hamstring tightness among physiotherapy students from Dakshina Kannada District.

This study found no correlation between gender and stiffness in the left or right hamstrings tightness. In line with previous findings, [11] reported no significant gender differences in hamstring tightness, with right hamstring tightness observed in 45.3% of males and 54.7% of females, and left hamstring tightness in 44.8% of males and 55.2% of females. In contrast, [1] found that men were more likely than women to have tight hamstrings. However, [33] furthermore showed a higher frequency in women than in men, indicating that discrepancies in results might be caused by variances in research populations, methodologies, and inclusion criteria.

There was no significant correlation between weight class and right hamstring tightness in the current investigation, while the prevalence of left hamstring tightness was significantly higher in participants who were overweight or obese than in those who were underweight or normal. This can be explained by

the fact that people who were overweight or obese had much lower back and abdominal muscular strength than those who were normal weight. Body weight has a negative correlation with trunk muscular strength [34]. Furthermore, weak core muscles have been associated with hamstring tightness. When the core is weak, the hamstrings are thought to overact and gradually contract in order to compensate for postural stability [35].

Although the right hamstring did not show a significant association with weight class, the increased tightness on the left side may reflect underlying biomechanical and functional asymmetries, such as leg dominance. Most individuals are right-leg dominant, and the dominant leg typically exhibits greater knee extensor strength than the non-dominant leg [36,37]. Research has also shown greater muscle mass increase as opposed to the left limbs in the right, with more pronounced asymmetry in the right leg [38].

muscle size is commonly associated with muscle strength [39]. This asymmetry in thigh muscle mass affects force distribution, causing increased uniaxial load on the lower limbs and vertebrae. Such imbalance can impair impulse force control and dynamic postural stability during activities like single-leg landing, raising the risk of slips and falls [40]. Evidence further suggests that quadriceps strength may influence hamstring flexibility, with some studies reporting a positive correlation between stronger quadriceps and greater hamstring extensibility. Therefore, the relatively lower quadriceps strength on the non-dominant (left) side may contribute to increased hamstring tightness, particularly under the additional mechanical load imposed by excess body weight [41]. These factors collectively may explain the side-specific relationship observed in this study.

In agreement with the findings of the present study, several previous investigations have reported a significant association between high BMI and reduced flexibility. [1] found a strong correlation between health professionals' BMI and hamstring tightness, showing that higher BMI levels were linked to more severe tightness. [42] also demonstrated that overweight and obese individuals had significantly lower hamstring flexibility scores than those of normal weight. In line with these findings. However, [43] found no significant relationship between hamstring tightness and BMI among young orthopedic surgeons, which may be attributed to differences in physical activity levels, occupation-related postural demands, or sample characteristics.

In the present study, no significant association was found between limb side and hamstring tightness. This finding aligns with those of [43], who reported no side predominance, with both limbs equally affected in young orthopedic surgeons. [44] examined the relationship between nonspecific lower back pain and the flexibility of the right and left hamstrings in women of various ages. They found that the right and left legs' hamstring flexibility differed significantly. [31] noted that in both males and females, the left side showed greater hamstring tightness when compared to the right but [30] found the right side to be more affected in both genders. These variations might result from variations in the research locations and patient characteristics.

Conclusion

The prevalence of hamstring tightness among physical therapy students found a notably high occurrence with mild tightness being the most frequently reported grade on both sides. Hamstring tightness is not influenced by limb dominance in the studied population and there was a relationship between overweight or obese and hamstring tightness.

Conflict of interests:

No conflicts of interest were declared among the authors.

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