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Exploring the Impact of Cross-Leg Sitting on Hip Mobility in University Students

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ABSTRACT

Background: Cross-legged sitting is a common posture, particularly among students, which may influence hip mobility. Prolonged sitting in this posture can affect hip joint movements, particularly internal and external rotation, as well as flexion and extension. The impact of this posture on hip mobility and range of motion remains underexplored.

Objectives: The objective of this study was to evaluate the impact of prolonged cross-legged sitting on hip mobility in university students, specifically examining changes in hip range of motion (ROM) including internal rotation, and external rotation.

Methods: A total of 503 students from Government College University Faisalabad were randomly selected for this cross-sectional study. Participants were required to sit on wooden or plastic chairs without padded cushions, and their daily sitting duration in the cross-legged position was recorded. Hip range of motion (ROM) was measured using a goniometer, and a self-made questionnaire was validated through a pilot study. Data were analyzed using SPSS software.

Results: The majority of individuals exhibit reduced hip mobility in both internal and external rotations, with most falling into the 30-50 Moderate, Mild, Severe category. For right internal rotation, 96.22% show decreased mobility, while right external rotation has 82.71% in the same category. Similarly, left internal rotation and left external rotation show 60.68% and 49.70% in reduced mobility, respectively. Chi square test demonstrated significant associations, highlighting that cross-leg sitting is linked to reduced hip mobility in both internal and external rotations of the right and left hips.

Conclusion: Prolonged cross-legged sitting negatively impacts hip mobility, especially hip internal rotation. Interventions to promote proper sitting posture are essential for maintaining hip joint health.

Keywords: Cross Leg Syndrome, Flexibility, Hip Joint, Joint Mobility, Posture, Range of Motion, Sitting

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Introduction

The hip joint, a ball-and-socket articulation between the acetabulum of the pelvis and the head of the femur, is crucial for various movements, including flexion, extension, abduction, adduction, medial rotation, lateral rotation, and circumduction. These movements are governed by specific muscle groups that facilitate the joint's dynamic function (1). Among daily activities, sitting is a ubiquitous posture that significantly influences the biomechanics and structural integrity of the lower extremities. Variations in sitting postures may exert diverse effects on the musculoskeletal system; however, their precise implications remain poorly understood. Prolonged sitting, particularly with crossed legs, is associated with adverse outcomes such as muscular imbalances, postural deviations, and altered joint mechanics. Improper sitting posture and duration are implicated in the development of postural abnormalities like kyphosis, lordosis, and scoliosis (2).

Sitting with legs crossed, characterized by one leg positioned over the other, can introduce detrimental effects on the musculoskeletal system, including irritation of the gluteal muscles and pelvic asymmetry. This posture alters the alignment between horizontal and inclined pelvic planes, potentially leading to gluteal muscle strain and coordination deficits during transitions between sitting and standing or movement. Furthermore, individuals with Lower Crossed Syndrome (LCS) commonly exhibit hyperactivity and tightness in the hip flexors and lumbar extensors, coupled with weakness in the deep abdominal and gluteal muscles, exacerbating the biomechanical disturbances (3). Sustained cross-legged sitting also fosters muscle imbalances and improper trunk muscle activation, disrupting postural stability and predisposing individuals to musculoskeletal dysfunction and joint degeneration. The constrained position limits knee joint extension and reduces the overall range of motion due to tension in the posterior thigh muscles (4).

In cross-legged sitting, hip flexion and adduction contribute to sacroiliac joint stabilization, which may reduce muscle fatigue through activation of the oblique muscles (5). However, this posture imposes rotational forces on the pelvis, leading to compensatory spinal torsion. Chronic pelvic rotation can alter the length-tension relationship of surrounding muscles, potentially causing discomfort, joint degeneration, and diminished joint mobility (6). Passive stiffness and muscle length modifications due to repetitive or prolonged postures are often attributed to structural changes, including reduced sarcomere numbers and connective tissue alterations. For instance, individuals wearing high-heeled footwear demonstrate decreased muscle fascicle length and range of motion in the gastrocnemius muscle, underscoring how chronic muscle shortening can increase passive stiffness (7). Similarly, habitual cross-legged sitting may exacerbate stiffness and mobility impairments, ultimately affecting hip and lower limb functionality.

Notably, prolonged sitting correlates with a heightened risk of developing low back pain (LBP), a condition with significant socioeconomic implications. Prevalence rates are alarmingly high, with office workers reporting an annual prevalence of 34%, while professional drivers face even greater risks, with monthly prevalence rates reaching 50% (8). Additionally, groin pain frequently observed in athletes, is often attributed to adductor tendinopathy. A condition exacerbated by repetitive and asymmetric loading during sports activities and prolonged sitting postures (9,10). Given these considerations, this study aims to explore the impact between cross-legged sitting and hip joint mobility.

Materials and Methods

This cross-sectional study was conducted over a three-month period to investigate the impact of prolonged cross-legged sitting on hip mobility. A total of 503 participants were randomly selected from Government College University Faisalabad, and the research was conducted in the physical therapy laboratory within the Basic Sciences block of the institution. University students who met the inclusion criteria, which required them to sit on wooden or plastic chairs without padded cushions for a minimum of 3–4 hours daily. Convenient sampling was employed to recruit participants. Before data collection, informed consent was voluntarily obtained from all participants, and the study protocol adhered to the ethical principles. Ethical approval was secured from the Institutional Review Board of Government College University Faisalabad.

The inclusion criteria encompassed individuals sitting on non-cushioned chairs, with leg and body dominance recorded (left-on-right or right-on-left leg positioning). Exclusion criteria included participants with hip pain, radiculopathy, hip infections, psychological issues, or pelvic dysfunction, as these conditions could confound the results.

Data were collected using a goniometer to measure hip mobility and a self-designed questionnaire validated through a pilot study. The questionnaire captured demographic and activity-related information, including sitting habits and postural preferences. Measurements of hip range of motion (ROM) were taken to determine any changes attributable to the cross-legged posture. The goniometer ensured precise and reproducible measurement of hip flexion, extension, abduction, adduction, and rotation.

Data collection was systematically performed in the physical therapy laboratory under standardized conditions. The data collectors were trained to ensure consistency and reliability in goniometric measurements and questionnaire administration. All measurements and observations were double-checked to minimize observer bias and enhance the validity of the results. Statistical analysis was conducted using SPSS software, version 25. Continuous variables were summarized as means and standard deviations, while categorical variables were reported as frequencies and percentages.

Results

The study was conducted on 503 University students. In terms of gender, 38.2% (192) of the participants were male, while the remaining 61.8% (311) were female. Regarding dominant side, the majority, 77.9% (392), were right-handed, while 22.1% (111) were left-handed.

Table 1: Characteristics of the Study Participants

Category	Sub-category	Frequency (%)
Age of the Participant	18-20 years	166 (33.0%)
	21-23 years	203 (40.3%)
	24-26 years	96 (19.1%)
	27-30 years	38 (7.5%)
Gender	Male	192 (38.2%)
	Female	311 (61.8%)
Dominant Side	Left	111 (22.1%)
	Right	392 (77.9%)
Year of Study	1st Year	146 (29.0%)
	2nd Year	142 (28.3%)
	3rd Year	86 (17.1%)
	4th Year or Above	129 (25.7%)
Sit with Legs Crossed	Yes	358 (71.2%)
	No	145 (28.8%)
Type of Seat in Class	Plastic Chair	171 (34.0%)
	Wooden Chair	209 (41.6%)
	Wooden Bench	107 (21.3%)
	Wooden Stool	16 (3.2%)
Comfortable Sitting Duration with Cross-Legs	1-10 minutes	190 (37.8%)
	10-20 minutes	187 (37.2%)
	20-30 minutes	85 (16.9%)
	More than 30 minutes	41 (8.2%)

The majority of individuals exhibit reduced hip mobility in both internal and external rotations, with most falling into the 30-50 Moderate, Mild, Severe category. For right internal rotation, 96.22% show decreased mobility, while right external rotation has 82.71% in the same category. Similarly, left internal rotation and left external rotation show 60.68% and 49.70% in reduced mobility, respectively.

Table 2: Distribution of Hip Joint Movements Across Different Severity Levels

Hip Movement	40-50 Normal	30-40 Moderate	20-30 Mild	10-20 Severe
R Internal Rotation	19 (3.78%)	153 (30.41%)	278 (55.34%)	53 (10.53%)
R External Rotation	87 (17.29%)	114 (22.67%)	285 (56.66%)	17 (3.38%)
L External Rotation	253 (50.30%)	141 (28.02%)	109 (21.69%)	0 (0.00%)
L Internal Rotation	198 (39.32%)	194 (38.53%)	108 (21.49%)	3 (0.60%)

The Chi-Square tests revealed significant associations between cross-leg sitting and hip mobility across both internal and external rotations of the right and left hips. For right internal rotation, the Pearson Chi-Square value was 329.089 (df = 9, $p < 0.001$), indicating a strong association between cross-leg sitting and reduced mobility. Similarly, for right external rotation, the Pearson Chi-Square value was 216.233 (df = 9, $p < 0.001$), further confirming this relationship. In the case of left internal rotation, the Chi-Square value was 25.852 (df = 9, p =

0.002), suggesting cross-leg sitting affects this movement as well. Lastly, left external rotation showed a Pearson Chi-Square value of 24.898 (df = 6, p = 0.001), indicating a significant association between cross-leg sitting and decreased mobility. Chi-Square test demonstrated significant associations, highlighting that cross-leg sitting is linked to reduced hip mobility in both internal and external rotations of the right and left hips.

Table 3: Statistical Analysis of Hip Movement Using Chi-Square Test

Hip Movement	Pearson Chi-Square Value	df	p-value
Right Internal Rotation	329.089	9	<.001
Right External Rotation	216.233	9	<.001
Left Internal Rotation	25.852	9	.002
Left External Rotation	24.898	6	.001

Discussion

This study investigated the effects of cross-legged sitting on hip mobility, revealing significant findings regarding its impact on joint function and posture. The results indicated that 71% of participants preferred sitting with crossed legs, while 29% did not adopt this posture. Among those who practiced cross-legged sitting, internal rotation of the hip joint was notably compromised, suggesting that prolonged periods in this position may negatively affect hip mobility. Additionally, the study highlighted that the right side was more dominant among the younger population, further emphasizing the role of habitual postures in shaping musculoskeletal patterns.

The findings align with earlier studies that demonstrated pelvic misalignment resulting from prolonged cross-legged sitting, with associated musculoskeletal imbalances and strain (8). This posture was previously shown to induce forward-leaning head posture, slouched shoulders, and uneven hips when maintained for more than three hours daily, exacerbating postural and mobility dysfunction (11). Furthermore, an upright sitting posture, compared to a slouched position, reduced lumbar and pelvic alterations and mitigated gluteal muscle strain, highlighting the importance of proper posture in preserving musculoskeletal health (12).

Research has also demonstrated that low back pain (LBP) patients experienced lower trunk flexion and greater pelvic tilt when sitting with crossed legs compared to healthy individuals, supporting the notion that such postures exacerbate postural deviations and gluteal tension imbalances (8). The current study's results are consistent with these observations, emphasizing the adverse effects of prolonged cross-legged sitting on hip mobility and overall postural alignment.

Interestingly, prior studies suggested a connection between prolonged sitting and reduced hip extension, with sedentary groups exhibiting limited passive hip extension compared to more active individuals. This relationship underscores the physiological changes associated with prolonged inactivity and sedentary behaviors, which may lead to hamstring stiffness and diminished flexibility (7,13). The findings of this study corroborated these insights, as prolonged sitting was associated with decreased hip joint mobility, highlighting the need for ergonomic interventions and awareness of proper sitting postures.

Muscle stiffness and joint range of motion are critical factors influenced by habitual postures. Miyamoto and Hirata (2019) reported that increased joint stiffness was positively correlated with reduced hip flexion angles, underscoring the role of repetitive postures in altering muscle properties (14). Similarly, sitting postures requiring minimal energy expenditure and prolonged durations were linked to adverse health outcomes, including pressure ulcers and tissue health deterioration (15,16). These findings reinforce the relevance of this study in addressing the biomechanical consequences of cross-legged sitting.

This study contributes valuable insights but is not without limitations. The use of convenient sampling may limit the generalizability of the findings to broader populations. Additionally, self-reported data from questionnaires may introduce recall bias. The study was also restricted to a specific demographic of young university students, which may not reflect the effects in other age groups or occupational settings. Future research should consider longitudinal designs and more diverse populations to explore the long-term effects of cross-legged sitting on hip mobility and overall musculoskeletal health.

Despite these limitations, the study underscores the need for awareness and education about ergonomic sitting practices. Health professionals and educators should emphasize the importance of regular movement, posture correction, and the avoidance of prolonged cross-legged sitting to prevent musculoskeletal imbalances and enhance hip mobility. Furthermore, the development of ergonomic seating solutions tailored to individual needs, incorporating gender-specific considerations, may reduce the risk of postural deviations and joint dysfunction (17). This study provides a foundation for further exploration into the biomechanical implications of habitual sitting postures and their broader health impacts.

Conclusion

Prolonged cross-legged sitting negatively impacts hip mobility, especially hip internal rotation. Interventions to promote proper sitting posture are essential for maintaining hip joint health.

Authors' Contributions

ICMJE authorship criteria	Detailed contributions	Authors
Substantial Contributions	Conception or Design of the work	1,2,3
	Data acquisition	2,3
	Data analysis or interpretation	1,3,4
Drafting or Reviewing	Draft the work	1
	Review critically	2,4
Final approval	Final approval of the version to be published.	1,2,3,4
Accountable	Agreement to be accountable for all aspects of the work.	1,2,3,4

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