THE RELATIONSHIP BETWEEN HAMSTRING FLEXIBILITY AND PERFORMANCE OF ATHLETES IN SABARAGAMUWA UNIVERSITY OF SRI LANKA

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ABSTRACT

The most frequent form of injury among the athletes is the hamstring injury, which is caused by tight hamstring muscles. The aims of this study are to investigate the hamstring tightness in certain sports and whether body height, femoral length, are related to hamstring tightness. The hamstring flexibility was assessed using the popliteal angle through kinovea analysis. The average values for popliteal angle for males were 29.00° and 28.66° for left and right extremities respectively. For females, the popliteal angle was obtained as of 27.83° and 27.57° for left and right extremities respectively. In this study 0.10299>0.05 for male athletes and 0.0950>0.05 for female athletes (P > 0.05) is not statistically significant. When taking the relationship between their sports performance and hamstring muscle tightness, it shows r = 0.9198 for female athletes and r = 0.8596 for male athletes. It indicates that the masculine side performs at a somewhat lower level than the female side in terms of performance. Compared to other evaluated categories of sports in the research, shown that there is no relationship between hamstring tightness and body height, femoral length confines of this study. Therefore, for athletes who participate in contact sports, adopting precautionary steps to avoid hamstring tightness should be a high concern.

Keyword: *Hamstring tightness, Sports Performance, Kinovea Analysis, Popliteal Angle, Athletes*.

1. INTROUCTION

Flexibility is a quality that improves safety and promotes the best possible physical activity and is dependent on the capacity to move fluidly. Typical muscle groups that tend to shorten include the hamstrings (Oduniaya NA, 2005). The hamstring muscle, also known as the semitendinosus, semimembranosus, and biceps femoris, covers the back of the thigh. (Weerasekara et al, 2013). Muscle tightness is brought on by a decline in the muscle's capacity to deform, which reduces the range of motion at the joint it affects (Akinpelu AO, 2005). Hamstring injuries are the most frequent type of injury among athletes and are caused by hamstring tightness. These wounds take a long time to heal, require a lot of medical attention, and lower an athlete's performance level.

Humans undertake a range of motions, with the lower back bearing the bulk of the load. It also serves as the body's axis pivot throughout daily motion. It has not yet been possible to live an upright lifestyle due to the lower back's current configuration. In order to handle this circumstance, the lower back has undergone minor alterations to continue acting as the body's pivot, including bending forward and inclining toward the center of the trunk to support the upper portion of the body. (HAYASHI, 2004). Other obstacles to the best use of evidence-based management include widespread misunderstandings among the general public and medical professionals (Huber M, 2016). Such actions could significantly lessen the handicap and suffering of persons who suffer from low back pain, while also improving the effectiveness and efficiency of their care on a worldwide. (Buchbinder R, 2001).

2. METHODOLOGY

Resources and Procedures of this descriptive study examined the prevalence of hamstring tightness among all athletes that compete for Sabaragamuwa University athletic team Sri Lanka. As study population, athletes who participated in university sports teams from 2018 to 2022 were anticipated. All athletes with ages ranging from 20 to 26 and a mean of 22, volunteered to take part in this study. Only athletes with "normal" levels of limb length disparity, generalized ligament laxity, scoliosis, hip dislocation, and other anomalies were permitted to participate in the research. All information was requested from the Sabaragamuwa University Department of Sports Sciences and Physical Education. This study was authorized by the Sabaragamuwa University of Sri Lanka's Faculty of Applied Sciences' Ethical Committee, and all participants provided their informed consent before participating. On the same day starting at 10 a.m, there were tests conducted. The individual verbal agreement was obtained first, after which instructions were given to familiarize them with the upcoming test and assessments.

2.1 Testing Procedure

Before the test began, all athletes had their Age, height and weight measured. Experiment Test for two times (Test 1 and Test 2). The athletes are positioned face down on the examination table on the day of the test, with the lower leg that is not being examined supported on the work surface. The knees of the opposite limb are stretched until they are parallel to the floor and the opposing limb is elevated until the hip is at a 90-degree angle.

This range must also be measured using a device with its fulcrum at the lateral epicondyle, a fixed arm parallel to the thigh pointing to the greater trochanter, and a moving arm parallel to the leg pointing to the lateral malleoli. Under the lumbopelvic area, a pressure biofeedback device was positioned. With the hip flexed, the Active Knee Extension Test assesses the range of active knee extension as well as the length of the hamstring muscles. The length of the hamstrings has been associated with a change in lordotic posture and a greater incidence of injuries to the lower limbs. The leg was raised straight in order to measure the hamstring length, but since the pelvis was not stabilized during this motion, the hamstring length could not be determined separately. The Straight Leg Raise is an essential technique for neurodynamic assessment because, in contrast to the active knee extension test, it places stress on the sciatic nerve. The popliteal angle is used very commonly for the assessment of hamstring contracture in patients with cerebral palsy.

The video analysis was performed in sagittal planes using one high-speed cameras, the athlete hip, thigh and knee area was the most critical part of this study, so this video frame was used to focus on center of knee area of the athletes. Center of Gravity (CG) coordinates were used to identify the measuring variables. Photographs were taken at a sampling rate of 60Hz using cameras. The trajectories of the Center of Gravity were found to be coordinated. Using a speed light, all of the cameras were in sync (Godox tt650).The data for the study was gathered through videotaping, measuring (Left and Right Leg Extremity), observations, and experimental methods(Figure 1). Sabaragamuwa University Main Playground was the location where all video data was gathered. The Kinovea software and Microsoft Excel 2016 were used for all analyses, and all measuring variables were calculated using descriptive statistics. Because of this, the athletes who agreed to take part in the research underwent video recording measures and an active knee extension test to gauge how tight their hamstrings were. The test measured the angle of both knees' active knee extension.

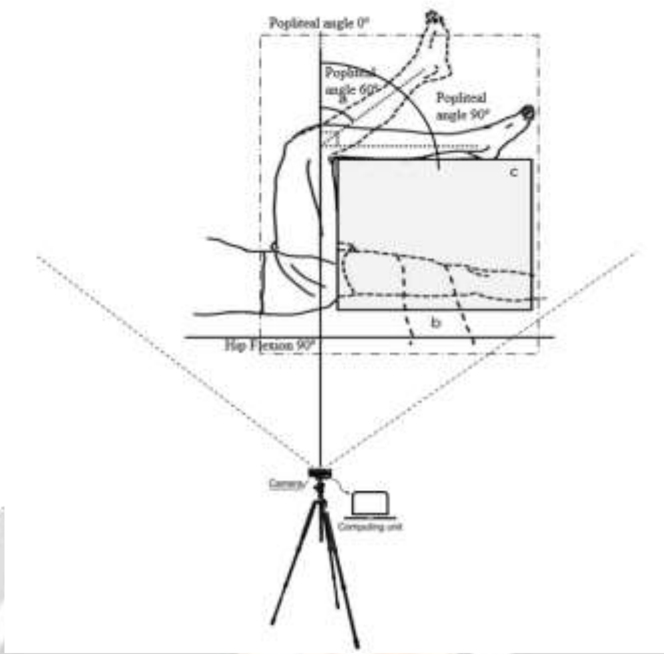

Fig -1: Experimental setting and starting position for testing (a-popliteal angle, b-stabilizing strap, c- adjustable support table). The popliteal angle is measured with the child supine and the hip flexed at 90 degrees.

3. RESULTS AND DISCUSSION

3.1 Statistical Analysis

All variables that were assessed underwent descriptive statistics. to evaluate the consistency between the two test sessions for tests 1 and test 2. For testing and follow-up tests on both extremities, the mean, range, and standard deviation for the angle of knee flexion were recorded. (Table 1).

Table 1. Male and Female Knee Flexion (°) and Reliability for Left and Right Extremities. (All (n = 80) the average values are included)

Table -1: Male and Female Knee Flexion (°) and Reliability for Left and Right Extremities. (All (n = 80) the average values are included)

Male Athletes (n = 40)					
Left extremity Knee Flexion (°)					
Average	Age	Height	Weight	BMI	Mean±SD
29.00	22	168.03	63.86	22.55	28.95±3.02
Right extremity Knee Flexion (°)					
Average	Age	Height	Weight	BMI	Mean±SD
28.66	22	168.03	63.86	22.55	28.74±3.34

Female Athletes (n = 40)					
Left extremity Knee Flexion (°)					
Average	Age	Height	Weight	BMI	Mean±SD
27.83	22	156.77	48.61	20.08	27.92±2.77
Right extremity Knee Flexion (°)					
Average	Age	Height	Weight	BMI	Mean±SD
27.57	22	156.77	48.61	20.08	27.69±3.39

Male

t-Test: Paired Two Sample for Means

	Left extremity	*Right extremity*
Mean	29.00119048	28.66071429
Variance	9.063352207	11.23518728
Observations	40	40
Pearson Correlation	0.859680934	
Hypothesized Mean I	0	

Female

t-Test: Paired Two Sample for Means

	Left extremity	*Right extremity*
Mean	27.74642857	27.43928571
Variance	8.144560105	12.99494338
Observations	40	40
Pearson Correlation	0.918948355	
Hypothesized Mean	0	

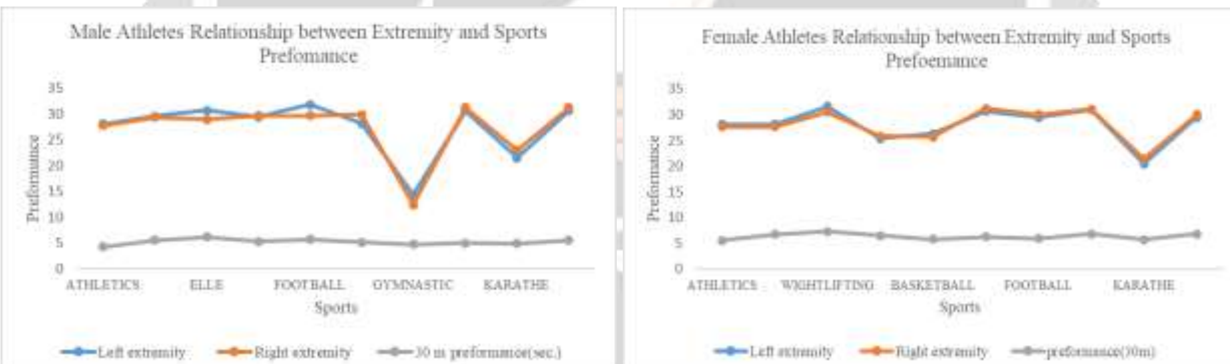

Chart - 1: Relationship Between Extremity and Sports Performance.

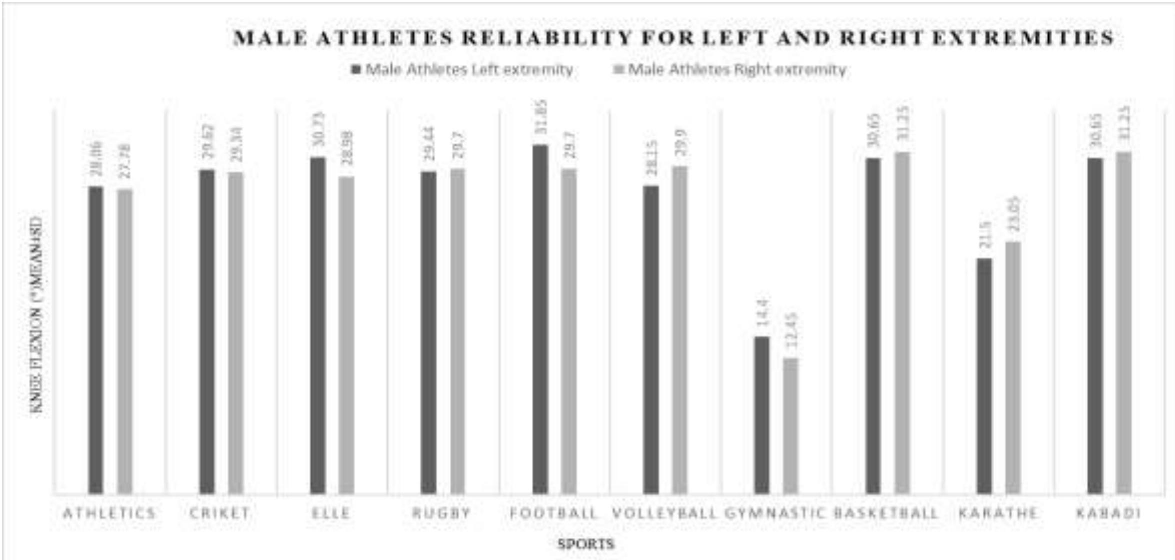

Chart – 2: Male Athletes Prevalence of hamstring tightness

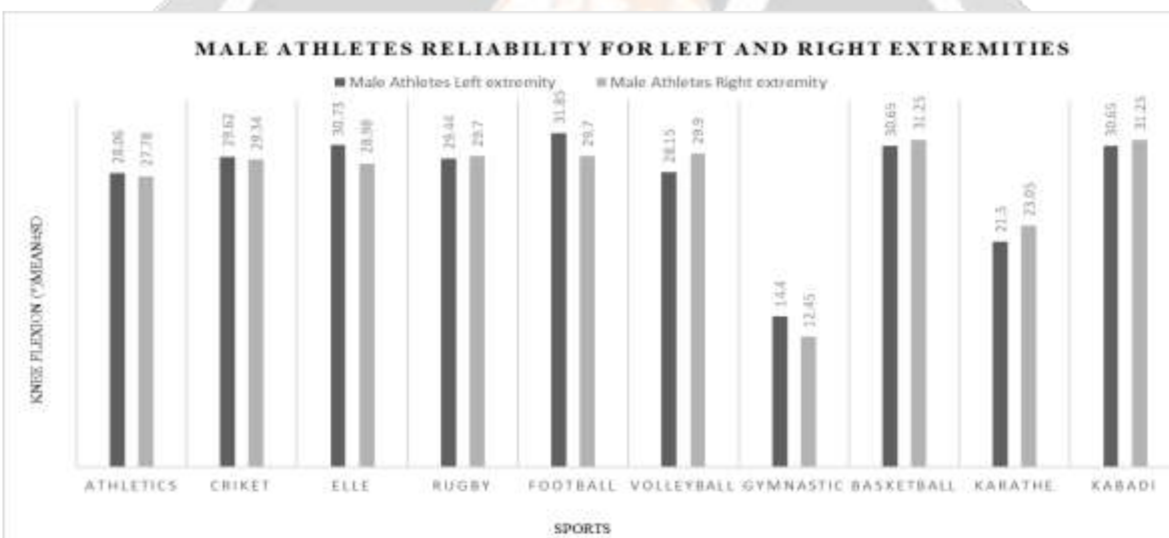

Chart – 3: Female Athletes Prevalence of hamstring tightness

The hamstring muscles were passively and statically stretched as the method of releasing hamstring tightness employed in this research. Data show that the range for left and right knee flexion in males is 29.00° and 28.66°, respectively, whereas the range for left and right knee flexion in women is 27.83° and 27.57°, respectively. It indicates that the feminine side performs at a greater level than the male side, with the male side performing at a little lower level. Also, the average values height (168.03), weight (63.86), BMI (22.55) of the male athletes and Female athlete average values are height (156.77), weight (48.61), BMI (20.08). Reduced flexibility may result in inefficiency at work and is also a risk factor for low back pain. Flexibility is a crucial physiological component of physical fitness. On chosen isokinetic situations, increasing hamstring flexibility was shown to be an effective way to improve hamstring muscle function. Athlete is not considered to have tight hamstrings if their knee extension range of motion is less than 160°. Before their practice sessions began, 40 male athletes and 40 female athletes had their active knee extension assessed using cameras. Athletes competing in a variety of sports had their hamstring tightness prevalence assessed on both legs. Contrary to athletes who engaged in athletics, martial arts, and other sports (such as weightlifting, volley ball, rugby, football, cricket, basketball, karate, and gymnastics), athletes who played contact sports had hamstring tightness at considerably higher rates. (Fig. 2-3) p>0.05 served as the threshold for statistical significance. No association between body height, femur length, warm-up and cool-down duration, or hamstring tightness was seen in the study (p>0.05). In this study 0.10299>0.05 for male athletes and 0.0950>0.05 for female athletes in P(T<=t) one-tail, P value higher than 0.05 is not statistically significant and indicates strong evidence for the null hypothesis. This means we retain the null hypothesis and reject the alternative hypothesis. You should note that you cannot accept the null hypothesis, we can only reject the null or fail to reject it. The findings of this research should be shared with the susceptible athletes, their coaches, and the relevant medical professionals in order to underline the need of a well-planned training regimen that will reduce hamstring tightness.

4. CONCLUSIONS

Athletes who participate in contact sports should pay particular attention to precautions to avoid hamstring strain. The right hamstring of the majority of athletes was tighter than the left. When performed by a single examiner under standardized settings, the Active Knee Extension test is an accurate and objective method for assessing hamstring muscle tightness. According to this study shows that the level of performance of the female side is higher than that of the male side, while the male side is somewhat lower. Because of their genetic and biological make-up of their connective tissues, women are often more naturally flexible than males. The fibroblasts of ligaments and tendons are known to have estrogen receptors, which are thought to stimulate fibroblast growth and collagen production. Women are given more flexibility as a result of this than males are. Women and men have extremely diverse body compositions in terms of weight distribution. Women benefit from more stability since their center of gravity is lower due to a smaller weight distribution on their hips and thighs. Women often have less problems with balance during stretches, thus it is thought that this has more of an emotional effect. Women are thought to be able to balance better than men in common scenarios because to their lower center of gravity, which gives them the impression that they are more flexible than males. Strict bodily stability, an obvious and well-defined end point of motion, and exact instrument positioning are all necessary for high dependability. If done correctly, the test ought to provide therapists working in a clinic or research context a trustworthy way to gauge how tight their hamstrings are.

Future studies may explore this topic further. This study may potentially be expanded to include the female population and the national teams. It does, however, have restrictions, such as the need that knee extension and vigorous abdominal contractions be present. So, for certain individuals with neuromuscular diseases, the test may not be suitable. Furthermore, the research did not look at inter-rater reliability. Examining the stabilized Active Knee Extension test's inter-rater reliability is crucial for generalization and clinical usage.

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6. REFERENCES

[1]. Akinpelu AO, B. U. (2005). Inluence of age on hamstring tightness in apparently healthy Nigerians. . *Journal of the Nigeria society of physiotherapy* , 15: 35-41. HYPERLINK "https://academicjournals.org/journal/JNSP/article-full-text-pdf/AA1043B65313." https://academicjournals.org/journal/JNSP/article-full-text-pdf/AA1043B65313.

[2]. Buchbinder R, J. D. (2001). Population based intervention to change back pain beliefs and disability: three part evaluation. *BMJ*, 322: 1516–20. HYPERLINK "doi:%2010.1097/01.brs.0000231771.14965.e4" doi: 10.1097/01.brs.0000231771.14965.e4

[3]. Chandana, A., & Hapuarachchi, H. (2021,). Biomechanical Evaluation of the Burpee Test Battery. *Scholars Research Library,European Journal of Sports & Exercise Science.*, 9 (10): 33-39. HYPERLINK "https://www.scholarsresearchlibrary.com/" https://www.scholarsresearchlibrary.com/

[4]. HAYASHI, Y. (2004). Classification, Diagnosis, and Treatment of Low Back Pain. *Journal of the Japan Medical Association*, Vol. 128, No. 12, 2002, pages 1761–1765. HYPERLINK "https://doi.org/10.1201/9781315195544" https://doi.org/10.1201/9781315195544

[5]. Huber M, v. V. (2016). Towards a ‘patient-centred’ operationalisation of the new dynamic concept of health: a mixed methods study. *BMJ Open* , 5: e010091. HYPERLINK "http://creativecommons.org/licenses/by-nc/4.0/" http://creativecommons.org/licenses/by-nc/4.0/

[6]. Oduniaya NA, H. T. (2005). The effects of static stretch duration on the flexibility of hamstring muscles. *African Journal of Biomedical Research*, *8*(2), 79-82. HYPERLINK "DOI:%2010.4314/ajbr.v8i2.35765" DOI: 10.4314/ajbr.v8i2.35765

[7]. Weerasekara et al. (2013). The Prevalence of Hamstring Tightness among the Male Athletes of University of Peradeniya in 2010. *International Journal of Physical Medicine & Rehabilitation*, Volume 1 • Issue 1 • 1000108. HYPERLINK "doi:10.4172/jpmr.1000108" doi:10.4172/jpmr.1000108

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