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Assessment of Hamstring Strength, Endurance and Flexibility in Bowlers.

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Abstract: The study was undertaken as the assessment of hamstring muscle strength, endurance and flexibility. To check strength modified sphygmomanometer test (MST), to check endurance single leg bridging test (SLBT) and to check flexibility sit and reach test (SRT) were taken. The variable factors of the study were the age of the player, years of experience of player, BMI wise categorization of the player. The study concluded that almost every participant has good strength, flexibility and endurance.

Introduction: Cricket is a world-famous sport that requires a combination of physical fitness, skill, and strategy. It is surely a noncontact sport but, overuse and impact injuries are common since players engage in a wide range of physical activities, including running, throwing, batting, bowling, catching, and diving. Overuse injuries are common and related to the physical demands of the sport, particularly in the delivery of the ball¹.

The bowling action involves repetitive twisting, extension and rotation of the knee and hip joint at the same time as absorption of large ground reaction forces over a short period of time. These movements, if performed incorrectly or too frequently, can lead to overuse injuries of the lower extremities and back, particularly in elite and high-level cricketers.²

Hamstring is a group of muscle on the posterior aspect of the thigh consists of Biceps femoris, Semitendinosus and Semimembranosus. Being an antigravity muscle, Hamstring muscle aid in maintaining body posture, holding position of pelvis and performing trunk movements in relation to lower extremity.³

The hamstrings limit knee extension just before and during heel strike, providing dynamic stability to anteroposterior translation of the tibia in relation to the femur, in tandem with the static stability afforded by the Anterior Cruciate Ligament (ACL). This limitation of extension constitutes an eccentric contraction such that there is controlled lengthening of the muscle as it “fires”.⁴

These muscles cross two joints and undergo eccentric contraction during the gait cycle. Injury most commonly occurs at the muscle tendon junction but may occur anywhere between the origin and insertion. Injury to the hamstring muscle complex (HMC) is extremely common in athletes and an important cause of posterior thigh and buttock pain.⁵

The long nature of the hamstring tendons leads to a greater “spring” effect that enhances athletic performance but increases injury risk. The interface between the muscle fibres and the relatively stiff tendon fibres is the weakest point of the muscle tendon unit in the skeletally mature.⁶

Acute hamstring injuries most commonly occur while sprinting in full stride. Classically the sprinting athlete experiences a sudden sharp pain in the back of the thigh, often causing the athlete to come to a quick stop and either hop on the good leg or fall. Additional symptoms may include swelling during the first few hours after injury, bruising or discoloration of the back of the leg below the knee over the first few days, and hamstring weakness that can persist for weeks.⁷

Inability to walk pain free for >1 day after injury was associated with a significantly increased risk of absence from sport. of >3 weeks in one study. With hamstring avulsions there may be a palpable gap and prominence of the retracted muscle bellies. However, with lower grade injuries, the clinical features are often less dramatic, with the athlete experiencing a mild tightening sensation and being able to continue to play. In late presentations of hamstring avulsions (>3 months post injury), the patient may report ongoing weakness since injury, an inability to sprint, pain when sitting, and, sometimes, sciatica.⁸

Direct or assisted participation of Hamstring is inevitable in activities like running, jumping and changing speed. Activities of Daily Living (ADLs) like, descending the stairs, transition from sitting to standing, walking, running etc. require eccentric contractions of Hamstring muscle. Lack of physical activity as well as sedentary life style can increase the risk of chronic diseases and reduce motor firing. According to literature, Hamstring is one of the muscles expected to be affected by prolonged sitting in terms of flexibility, strength and endurance.⁹

Eventually, prolonged sitting can also lead to Hamstring muscle shortening. Reduced activation of motor units has been reported in sedentary individuals. And who are under no professional guidance while playing recreationally are exposed to a wide array of musculoskeletal injuries due to lack of awareness of proper warming up, stretching and cool down techniques.¹⁰ The etiology of hamstring muscle injury continues to be confusing and incomplete for clinicians and researchers.¹¹ Fitness parameters like, muscle flexibility, strength and endurance are important for injury prevention there by inducing muscle wasting especially, muscles of lower extremity.¹²

Material and Methodology:

Methods:

Study Design : Analytical
Sample Population : Bowlers
Sample Age Criteria: Under 20
Sample Size : 50
Study Duration : 1 Year
Study Setup : Cricket Ground/ Stadium

Materials:

- Demographic data sheet
- Pen
- Sit and Reach Box
- Aneroid Sphygmomanometer (if not available, then simple Sphygmomanometer can be used).
- Consent Form
- Stop Watch

Inclusion Criteria:

- Bowlers.
- Willing Participation.
- Must be practicing Cricket since minimum one year.

Exclusion Criteria:

- Underwent recent surgery/ injury/ accident
- Neurological Abnormalities
- Players who haven't played recently

Outcome Measures:

- Sit and Reach test (SRT)(validity- 0.76)
- Modified Sphygmomanometer test(MST) (0.94)
- Single leg Bridging test(SLBT)(0.89)

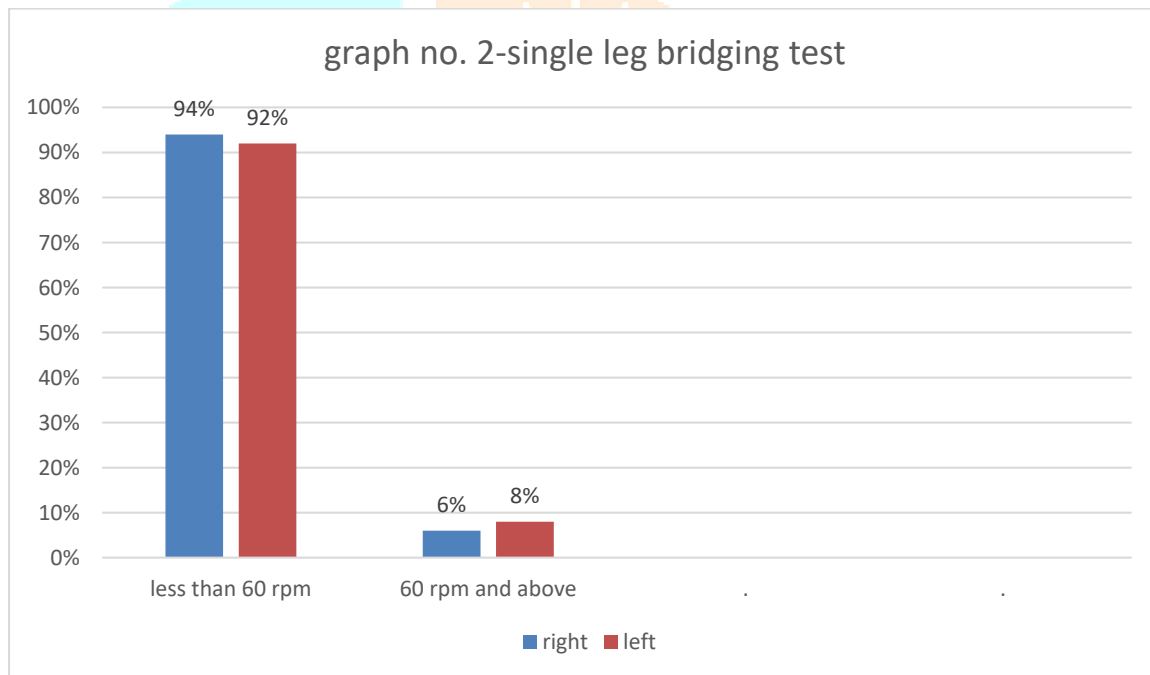
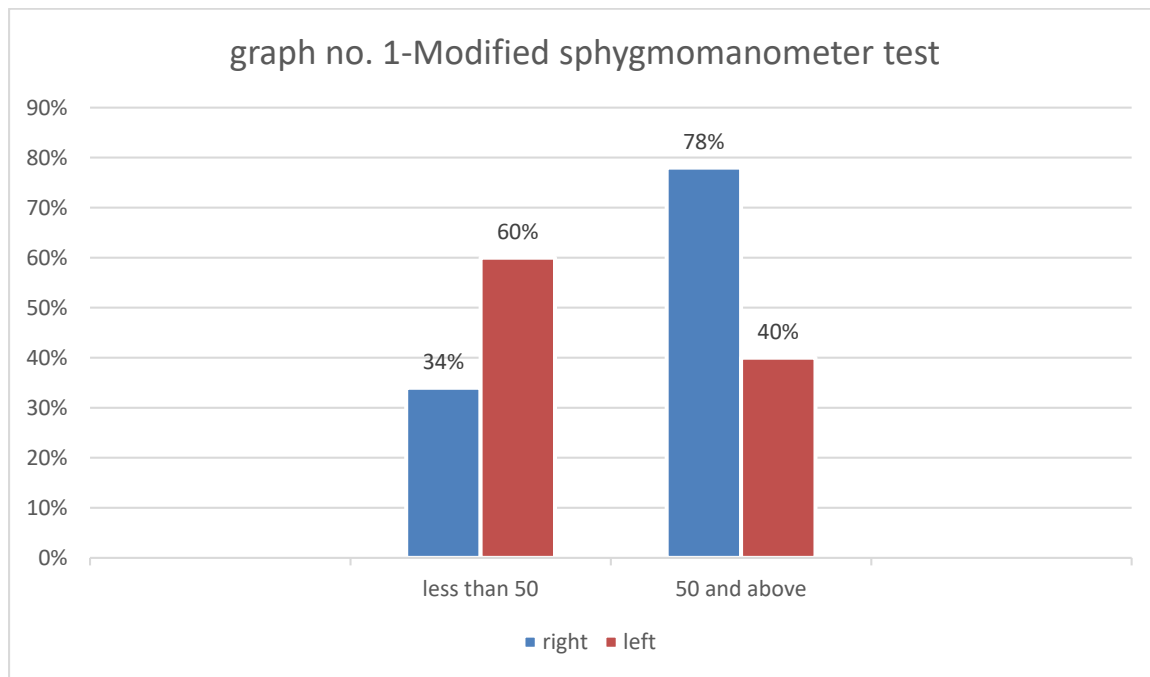
Procedure:

Cricket players from cricket academy were evaluated. According to inclusion criteria and exclusion criteria, participants were collected. The total number of subjects in the study were n=50. Each subject who participated in this study was informed about the aim of research and explained about tests which were going to be performed. After explanation of aim, test and steps of test, team coach has given permission for the experiment. Consent form has been signed by every participant. All subjects are medically stable. All subject took participation in experiment voluntarily. The individual's healthy history was included in the assessment form Name, Age, Height, Weight, Hamstring flexibility, strength and endurance of subject. To assess flexibility of hamstring muscle, I've used Sit and Reach Test. In this test subject has to sit in long sitting position in front of sit and reach box, subject has to bend forward and try to touch the scale as much they can but during this test knees of the subject should be straight. To assess endurance of hamstring muscle, ask the subject to Lie on your back with your hands by your sides, knees bent, and feet flat on the floor (under your knees). Lift one foot, extending the leg fully so it is roughly 45 degrees to the floor. This is the starting position. Raise your hips, tightening your abdominals and buttock muscles to support the lift, until your shoulders and knees are in a straight line. Squeeze your core at the same time, as if trying to pull your belly button back toward your spine. And for assessing strength modified sphygmomanometer test was performed, in which the subject is in sitting position, and is asked to apply maximum strength by ankle, behind which cuff of sphygmomanometer is placed to measure the strength of hamstring muscle and to be done same with the other leg. After explaining the test, start with the procedure. After the test has been performed, all values have been recorded. Result has been concluded by graph.

Results:

Table no. 1: Demographic data

Demographic data	Mean	Standard deviation
Age	52.76	64.801
BMI	22.112	52.134
Years of experience	4.4	36.0624



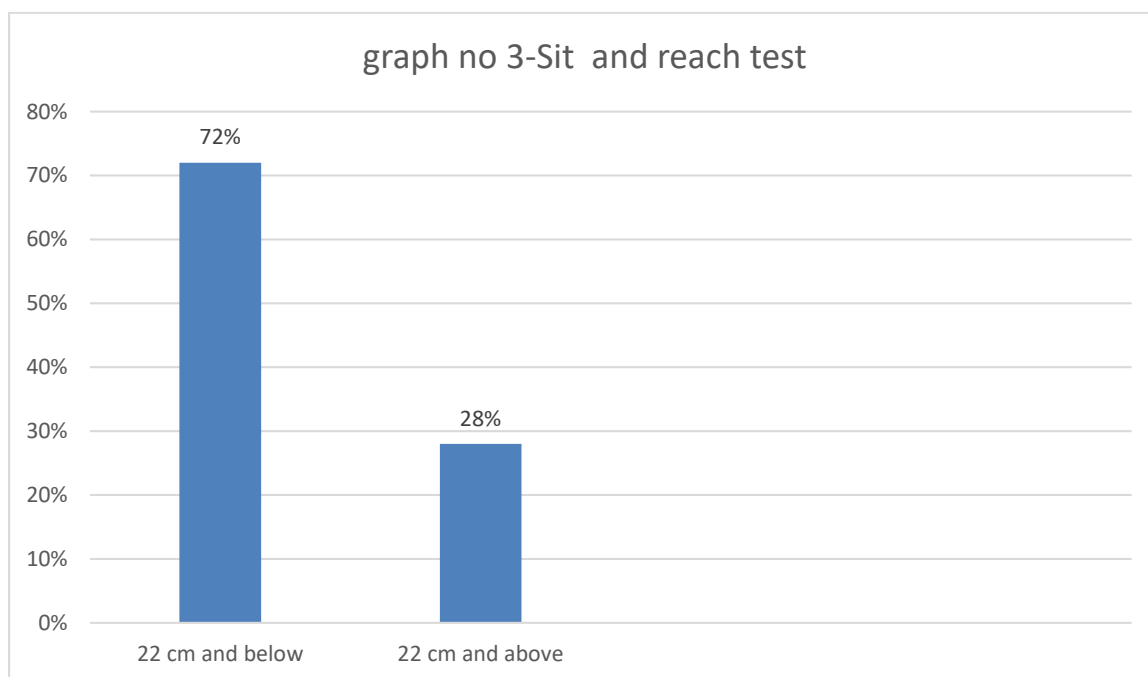


Table no. 2

Test	Mean	Standard deviation
Sit and Reach test	20.06	2.90798
Modified sphygmomanometer test (right)	50.8	9.07524
Modified sphygmomanometer test (left)	49.8	9.48472
Single leg bridging test (right)	43.74	6.13452
Single leg bridging test (left)	43.78	5.99095

Discussion:

The study aim was to assess hamstring muscle flexibility, endurance and strength of hamstring muscle in bowlers. Initially synopsis was approved by ethical committee and permission for data collection was received from coaches of different football clubs in Pune. In study 50 cricket players were selected according to inclusion and exclusion criteria. History of previous injury was asked to each participant then demographic data was taken. After the consent form was received by participants modified sphygmomanometer test, Sit and Reach Test and Single Leg Bridging Test was performed.

Sit-and-reach (SR) tests have been widely used to assess hamstring extensibility. However, it remains unclear to what extent hamstring stiffness (a measure of material properties) contributes to SR test score. Sit and reach test is used to assess or check flexibility of hamstring muscle. This test is important as because tightness in this area is implicated in lumbar lordosis, forward tilt and lower back pain. The most logical measure is to use the level of the feet as recording zero, so that any measure that does not reach the toes is negative and any reach past the toes is positive. The Modified Sphygmomanometer Test (MST) is an alternative method for the measurement of strength, since it is cheap and provides objective values. The sphygmomanometer without adaptation is not time consuming, compared to the other adaptations, and showed the capability of measuring higher values of strength. The bag method was easily trained to be used and stabilized.

In addition, Single leg bridge test (SLBT) is an adequate field test for the assessment of hamstring endurance in order to detect hamstring muscle asymmetry in young bowlers. This test requires little equipment, money, and can be performed on multiple players simultaneously. This test is easy to explain and easy to do for participants or patients so that this tool is most frequently used. The SLBT may be a useful tool to assess knee flexor muscle capacity in individuals with PFP in a clinical setting.

Most of the times it is found that players ignore their knee pain and injuries and continue their sports without consulting any medical personnel. So, this study shows the result with the conclusion.

Out of total 50 Samples, Age of participants was from 14 to 20 years. Years of experience was ranging from 1 to 8 years. The BMI wise distribution was 17 -33. The average value for years of experience in this study was 4.88 years. In this study, Hamstring flexibility of participants was ranging from 17 to 42. The mean value of sit and reach test (flexibility) was 25.7 cm. For endurance of left leg, values are ranging from 52 to 68 and the mean value for this test was 58.76. As same for endurance of right leg, values are ranging from 52 to 76 and the mean value for SLBT of right leg was 60.08.

As shown in Table no. 1, when age wise, BMI wise and years of experience distribution of participants was done, in which overall mean and standard deviation was calculated.

As shown in graph no. 1 Readings of modified sphygmomanometer test were taken and the maximum force applied by right leg, was noted down and divided into group 1 (less than 50) which consists of 17 (34%) participants, group 2 (50 and above) which consists of 33 (78%) participants. And afterwards left leg's measurement was noted down and divided into group 1 (less than 50) which consists of 30 (60%) participants, group 2 (50 and above) consists 20 (40%) participants.

As shown in graph no. 2 Readings of single leg bridging test were taken by observing maximum repetition made by right leg, readings of Single Leg Bridging Test were taken and number of repetitions in 60 seconds were noted. In this, group 1 i.e. less than 60 rpm are 47 (94%) and group 2 i.e. 60 and above are 3 (6%)

Afterwards Readings of single leg bridging test were taken by observing maximum repetitions made by left leg, group 1 i.e. less than 60 rpm are 46 (92%) and group 2 i.e. 60 and above are 4 (8%).

As shown in graph no. 3 Sit and reach test was taken and reach distance were noted. As 22 cm (9 inches) is considered as zero and below 22 cm is negative value and above 22 cm is positive value.

As shown in Table no. 2, Sit and Reach Test is mean-20.06 and S.D-2.90798. SLBT (right leg) is mean-43.74 and SD -6.134. SLBT (left leg) mean is 43.78 and SD is 5.990. Modified sphygmomanometer test (right) mean is 50.8 and SD is 9.075. Modified sphygmomanometer test mean is 49.8 and SD is 9.484.

Total 50 participants were taken and assess the measures based on inclusion and exclusion criteria. Local club cricket players were investigated for study. They were explained with the aim objectives of the study. The assessment for study reported out of 50 participants.

Conclusion: The study concluded that almost every participant who is cricket player has good strength, flexibility and endurance.

Limitations and future scope:

- Previous surgery, injuries to the participants were not considered.
- Neurological abnormalities to the participants were not considered.
- Only recreational football players were considered.
- Players with age group 14-30 years had taken.

Future scope of study:

- This study can be used in order to create awareness among non-professional players about proper warming up and stretching techniques.
- A comparative study can be done where the flexibility of non-professional cricket players is compared to professional footballers.
- The study can also be done on comparison of players of the age groups and their flexibility, endurance.

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