

## Effect of Concentric Versus Eccentric Hamstring Strength Training in Improving Anaerobic Strength among Football Players



### Medical Science

**KEYWORDS:** Concentric hamstring curls, eccentric hamstring curls, 40 yards dash test.

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### ABSTRACT

*Objective:* Football sports involves bouts of sprinting strength in hamstring strength in hamstring muscle as it is important component in improving performance which can be applied to football sport. The purpose of this study is to know the effectiveness of concentric or eccentric hamstring strength training exercise (isotonic) in improving anaerobic strength among football players.

*Design and setting:* A pretest and post test experimental comparative study. The subjects were used to examine the differences in concentric exercise and eccentric exercise with hamstring curl apparatus for duration of 6 weeks in 12 sessions each.

*Subjects:* Thirty subjects of male football players at recreational level were divided into two groups. A concentric exercise group and eccentric exercise group given training in isotonic with hamstring curl exercise apparatus and training was given with duration of 6 weeks for 12 sessions. The procedure was done in Physiotherapy Department at college of physiotherapy, Saveetha university.

*Outcome Measurement:* 40 yards dash test was done for evaluating anaerobic strength is used to compare pre-test and post-test values of both groups.

*Results:* Statistical analysis shows significant difference in pre and post test score done by both the groups.

*Conclusion:* The results of the study indicate that group B which received eccentric training had significant effects in improving anaerobic performance.

### 1. Introduction

Hamstring strength is important in football player's. Increased muscle power output during intermittent and sprint exercises are also applicable to football and other sports associated with high intensity intermittent sprinting<sup>1,2</sup>.

Hamstring injuries remain a significant cause of injuries in sprinters. The time lost through a hamstring injury can cause major disruption to an elite athlete training and competition schedule<sup>3</sup>.

In sprint gait cycle during the forward swing phase the activity of the hamstrings increase as they eccentrically restrain the terminal stages of hip flexion and knee extension once the terminal stage of the forward swing phase was complete. The hamstrings concentrically contract to extend the hip and flex the knee. The hamstrings play the role of hip extensors during the stance phase of running and sprinting<sup>4</sup>.

Hamstring strength plays an important role in sprint gait cycle in football players. Football players need to develop the musculature of a sprinter. Football players are benefited by leg strength training of a sprinter. Football players are benefited by leg strength training with heavy resistance for developing acceleration and speed. Maximal leg strength is useful for developing speed and power<sup>5,6</sup>.

The purpose of the study is to examine the effect of concentric and eccentric (isotonic) hamstring strengthening exercise in improving anaerobic strength among football players<sup>7,8, and 9</sup>.

It is difficult to measure the rates at which muscles produce and transfer energy internally. Only the external manifestations of the energy are capable of measurement<sup>6</sup>.

Anaerobic power test are available to test the maximal activation of ATP-CP system. These tests provide easier evaluation for intermediate energy system<sup>10</sup>.

Isotonic resistance exercise is a dynamic form of exercise carried out against constant or variable load. It can be performed either concentrically or eccentrically. In this study concentric and eccentric strength training is given.

40 Yard dash test is used for evaluating anaerobic strength in this study<sup>11</sup>.

All the subjects filled out a participation health status question-

naire to determine eligibility<sup>18</sup>.

This study is focused on improving anaerobic strength of football players through concentric and eccentric hamstring strength training. The objective of the study is to compare the effect of concentric versus eccentric hamstring strength training in improving anaerobic strength among recreational football players.

### 2. Methodology

All thirty recreational football players of age 18-30 were selected and randomly allotted for group -concentric and eccentric hamstring strength training group.

All subjects asked to fill out a participation health status questionnaire to determine the eligibility. History of previous No hamstring injuries, no performance enhancing drugs and no weight training for the lower extremity for the past 6 months were included. Previous injuries to hamstring or knee are excluded for this study.

The subjects are explained about the mode, effect and use of exercise. An informed consent is obtained from all the eligible subjects.

Subjects of both concentric and eccentric group evaluated with pretest anaerobic strength using 40 yard dash test. This test involves running a single maximum sprint over a distance of 40 yards on the flat surface.

#### 2.1 Procedure

The subjects were explained about the safety and simplicity of the procedure (Training Program).

##### 2.1.1 40 Yards dash test -pretest

The athlete's stretches and warm-up. After warm-up the athletes were put into standard starting position with a foot behind the starting line, with no rocking movements and had a dash run up to 40 yards.

Both the groups were evaluated prior and after the training. 2 trials were recorded and the best time was taken.

##### 2.1.2 Concentric and eccentric hamstring strength training:

The hamstring strength training was given in hamstring isotonic curl machine.

After pre test session the subjects were assigned to the concen-

tric and eccentric training groups for 6 weeks duration .hamstring strength training program was initiated.

Each session began by having the subjects perform a 3 minute warm-up on a stationary bicycle.

Each subject performed a serious of lower extremity flexibility exercises including hamstring, quadriceps and calf stretches.. Each stretches was performed 3 times and hold for 15 seconds.

The subjects lie prone in facing the bench, standing between bench and lever pads and grasp the handles and the exercise was executed by instructing the subjects to raise the level pads until knees are straight and repeat the same.

Each group started with 1 set of 8 repetitions using 50% of their pre determined 1 RM value .the concentric and eccentric loads were equal during the warm up sets.

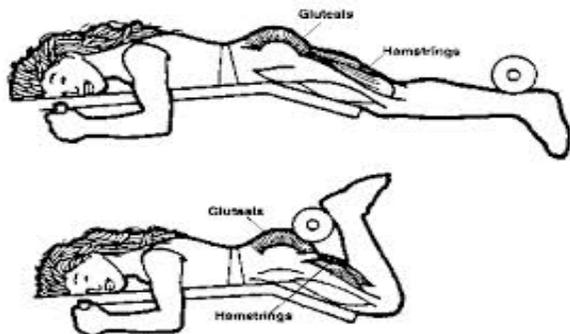


Figure No-1

Following the warm up these subjects of concentric and group performed 2 sets of 8 reptilians with weight of 80% of their 1 RM value .The Eccentric group was given with the concentric load was placed at 40% of the 1 RM value and eccentric load was placed at 100% of the 1RM .

**1 Minute rest was given between the both sets.**

At the end of each workout session the subjects were asked to assess their perceived level of exertion using the modified Borg scale .Training session was separated by 2 day rest period.

If the subject where able to complete both training sets of 8 repetitions without failure and had perceived level of exertions of less than 8 ,the 1 RM value was increased by 5.44 kg at next hamstring training workout.

The concentric training group therefore maintained a workload equal to 80% of their adjusted 1RM value thou gout the protocol while the eccentric group maintained concentric: eccentric ratio of 40% and 100% of the adjusted 1RM value.

Upon returning for each subsequent training session, subjects were asked to report their level of muscle soreness.

Duration of the training was given for 6 weeks of 12 training sessions. The frequency allows adequate recovery time for tissue repair after eccentric strength training.

At the end of 6 weeks all subjects were tested with 40 yard dash test.

**3. Statistical Analysis**

The collected data were tabulated and analyses using descriptive statistics to access all the parameters. Mean and standard deviation was used to find out significant changes between pre and post test by paired t test.

**3.1 Significance of difference between pre-test and post-test score of Concentric Group: No of subjects - 15**

Calculated't' value is 4.29 for 14 degree of freedom at 5% level of significance.

The interference shows significant difference between pre-test and post-test score of the concentric group.

Group A (Concentric)	Mean (Secnds)	Standard Deviation	Mean Difference	T value	P value
Pre-test	6.370	0.385	0.128	4.29	.0007
Post-test	6.242	0.372			

Table No-1

**3.2 Significance of difference between pre-test and post-test score of Concentric Group: No of subjects - 15**

Calculated't' value is 6.43 for 14 degrees of freedom at 5% level of significance.

The interference of the above table is that there is significant difference between pre-test and post-test score of group -B since the calculated't' value is greater than the tabulated' value.

Group B (Eccentric)	Mean (Secnds)	Stndrd Deviatn	Mean Difference	T value	P value
Pre-test	6.587	0.429	0.408	6.43	.0001
Post-test	6.179	0.515			

Table No-2

**3.2 Significance of difference between Concentric Group A and Eccentric Group B:**

Calculated't' value is 3.99 for 28 degree of freedom (n1+n2-2=18) at 5% level of significance

The inference of the above table is that there is significant difference between pre-test scores of both groups since the calculated't' value.

So the null hypothesis is rejected, stating that eccentric strength training group is effective in improving anaerobic strength in football players.

Post Test	Mean (Secnds)	Stndrd Deviatn	Mean Difference	T value	P value
Concentric A	0.128	0.115	0.28	3.99	.0004
Eccentric B	0.408	0.245			

Table No- 3

**4. Conclusion**

Statistical analysis was done by paired't' test and independent 't' test which showed significant difference in pre and post test score in eccentric anaerobic strength when compared to concentric anaerobic strength .

Hence stating that eccentric hamstring training is effective in improving anaerobic strength among football players.

**5. Discussion**

The results of this study indicate that there is statically significant improvement in anaerobic capacity when the athletes are trained using eccentric exercise.

Exercises featuring heavy eccentric load can actually support a greater weight and muscles are approximately 10% stronger during eccentric contractions than during concentric contractions.

Physiology of eccentric contraction supports the results .the muscles can supports greater weight and approximately 10% stronger than concentric activity comparing the muscle gains in concentric and eccentric hamstring strength training.

Thus eccentric hamstring strength training has greater advantage in improving anaerobic capacity and there by influencing proper sprint gait cycle and thereby improving performance in football players.

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