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EFFECTIVENESS OF SPRINT TRAINING VERSUS PLYOMETRIC TRAINING ON STRENGTH OF KNEE MUSCULATURE AND AGILITY IN COLLEGIATE MALE CRICKET PLAYERS

DR. A. POLAVARAM TEJA [1] | DR. A.VISWANATH REDDY [2] | DR. K. MADHAVI [3]

[1] MPT (SPORTS MEDICINE) , SVIMS, COLLEGE OF PHYSIOTHERAPY.

[2] MPT (SPORTS), PH.D., ASSOCIATE PROFFESOR, SVIMS, COLLEGE OF PHYSIOTHERAPY.

[3] MPT (CT), PH.D., PROFESSOR, HOD, PRINCIPAL, SVIMS, COLLEGE OF PHYSIOTHERAPY.

ABSTRACT:

INTRODUCTION:

Cricket is a team game which place considerable demands on the physiological and neuromuscular system the muscular strength of lower limbs, agility, endurance, power, speed, etc are the important components of fitness for cricketers.

Agility is the ability of the neuromuscular system to coordinate explosive changes of direction of an individual or multiple body segments in all planes of motion at variable velocities in an efficient and effective manner.

Plyometrics are training techniques used by athletes in all types of sports to increase strength & explosiveness or power. Sprint running is also an explosive movement & commonly used as explosive exercise training in individuals & team sports.

OBJECTIVES:

To evaluate the pre and post therapeutic values of strength (peak torque) of knee musculature and agility after sprint and plyometric training by using Iso kinetic analyser and Illinois agility test.

METHODOLOGY:

The study design is an experimental study which consists of 30 subjects with two groups namely, plyometric group and sprint group, each group consists of 15 subjects. And study duration was 6 weeks. Outcome measures are peak torque of knee muscles and Illinois agility test.

RESULTS:

After the analysis, the results revealed significant improvement of strength of knee muscles in both the groups ($p < 0.00$). The subjects of plyometric group showed significant results when compared with sprint group.

CONCLUSION:

By comparing the difference between mean and standard deviation in both the groups, plyometric group has significant improvement of strength of knee musculature and agility than the sprint group.

KEYWORDS:

PLYOMETRIC TRAINING, SPRINT TRAINING, ISO KINETIC ANALYSER, PEAK TORQUE, ILLINOIS AGILITY TEST, STRENGTH , QUADRICEPS , HAMSTRINGS.

INTRODUCTION

Cricket is a team game and cricketers have to perform different role as a bowler, fielder or as a batsman in the same game which consists of intermittent activity during which players are required to repeatedly perform striding , sprinting , turning & jumping , which place considerable demands on the physiological and neuromuscular system[1]. Therefore the muscular strength of lower limbs, agility, endurance, power, speed, etc are the important components of fitness for cricketers[2].

Agility is the ability of the neuromuscular system to coordinate explosive changes of direction of an individual or multiple body segments in all planes of motion at variable velocities in an efficient and effective manner[3]. Agility training is thought to be a re-enforcement of motor programming through neuromuscular conditioning and neural adaptation of muscle spindle, Golgi-tendon organs, and joint proprioceptors[4].

Strength can be defined as the forceful concentric muscle action resisted by a rapid eccentric action. Strength training is one of the important technique which can prevent injuries and also strengthen the bones and muscles for respective movement which has high velocity results in maximum powerful actions. Plyometric training and Sprint training are one of the training techniques used for strength training[5,6].

Plyometrics are most frequently used in lower extremity strength and power exercise programs, and are defined as quick powerful movements that involve a pre stretch of a muscle just before its contraction. The pre stretch is the

most important phase of the plyometric activity because it increases the excitability of the neurological receptors, which enhances the reactivity of the neuromuscular system. Plyometric training is an effective mode of training as it enhances motor learning and neuromuscular efficiency by promoting the excitability, sensitivity, and reactivity of the neuromuscular system to increase the rate of force production (power), motor-unit recruitment, firing frequency (rate coding), and synchronization[7].

Plyometric training also called stretch shortening drills or stretch strengthening drills or reactive neuromuscular training[8].

Plyometrics typically consists of rapid stretching of muscle (eccentric action or lengthening phase) immediately followed by concentric or shortening action of same muscle and connective tissue. This whole process is called as stretch shortening cycle[1]. The period of time between the stretch and shortening cycles is known as the amortization phase. Amortization phase is kept very brief by a rapid reversal of movements to capitalize on the increased tension in the muscle[8]. Plyometric training has been an effective method in improving running economy, joint stability, increased joint awareness and overall proprioception and decrease the severity of knee injuries[1].

Sprint training contributes in varying degree of success full performance in many sports. Sprint running is also an explosive movement & commonly used as an explosive exercise training in individuals & team sports. The primary objectives of sprint training program is to achieve an efficient style or technique in order to maximize the dynamic athletic lower body performance as well as providing stability in the trunk[3].

The shorter game formats tend to be more physically intensive when related to match duration, incorporating more maximal sprints when fielding, bowling, and batting . As a result of these demands, running speed has become an essential athletic quality for cricketers. Typical sprint distances often used to assess team sport athletes include 5 m, 10 m , 20 m, and 30 m . These shorter intervals are likely to have great value for cricketers. A “quick single” involves a batsman sprinting maximally over the 17.68-m crease-to-crease distance in an attempt to score a run. Given that running speed is the main contributor to a player’s performance in running between the wickets. The mean sprint distance when fielding is 15–18 m, and maximal sprints between the wickets when batting are conducted over a pitch distance of 17.68 m[9]. Sprint training contribute for the improvement of agility and strength of the athletes.

Hence the purpose of this study was to compare the both the training techniques, used to improve the agility and strength of the knee musculature.

NEED OF THE STUDY

Cricket is basically a bat and ball game played between two teams of eleven players. Cricket is a popular team game in most commonwealth countries. A successful player needs good balance and strength, speed and agility for running between the wickets and in the field, and bowlers particularly need very good speed and power. So, a good fitness training for cricket players should include Endurance, Sprint Fitness & Speed/Agility/Quickness (SAQ), Muscular Strength, Flexibility and Cricket specific training. There have been many studies in the past on plyometric training and sprint training, the studies were mostly on elite players. There were less studies on collegiative cricket players. College level players focus less on their fitness regime and end up with injuries at the end of game. Hence the need of the present study was to compare the effectiveness of plyometric training and sprint training on strength of knee musculature and agility in college level cricket players.

AIM OF THE STUDY

To compare the effect of the sprint versus plyometric training on the strength of the knee musculature and agility in collegiate cricket players

OBJECTIVES OF THE STUDY

1. To evaluate the pre and post therapeutic values of agility using Illinois agility test in sprint training group.
2. To evaluate the pre and post therapeutic values of the strength of knee musculature (peak torque) using isokinetic analyser in sprint training group.
3. To evaluate the pre and post values of agility using Illinois agility test in plyometric training group.
4. To evaluate the pre and post values of strength of knee musculature (peak torque) using isokinetic analyser in plyometric training group.
5. To compare the difference between the two groups.

HYPOTHESIS

NULL HYPOTHESIS

There is no significant effect of sprint & plyometric training on agility & strength of knee musculature in collegiate cricket players.

ALTERNATE HYPOTHESIS

There is a significant effect of sprint & plyometric training on agility & strength of knee musculature in collegiate cricket players.

MATERIALS

The following materials are used in the study:

- Drill Cones
- Inch tape
- Stop watch

METHODOLOGY

STUDY DESIGN: Two way experimental design without control group

STUDY SET UP: Students who are playing cricket at SV University and SVIMS COP

STUDY TECHNIQUE: Simple random sampling technique

INCLUSION CRITERIA:

- Age: 18 to 25 years
- BMI: between 18 to 25
- Gender: males

EXCLUSION CRITERIA:

- Age: below 18 years
- BMI: less than 18 more than 25
- Gender: females
- Subjects who undergone specific plyometric training
- Subjects having lower extremity and back injury
- Recent fracture , acute inflammation & hyper mobility of joints

OUT COME MEASURES:-

1. Illinois agility test
2. Peak torque of knee musculature using Isokinetic analyser

INTERVENTION

After fulfilling the inclusion and exclusion criteria the participants were allocated randomly into two groups, i.e., plyometric training group and sprint training group. Each group consists of 15 participants.

Informed consent form was obtained from all participants. All the participants also received the verbal explanations of the exercise program and the tests prior to the commencement of the study.

Prior to taking of pre values the participants were explained about the testing procedures in detail.

The pre values of the agility was measured by Illinois agility test. Before the IAT was performed small set up was done, the test area was measured and marked using cones, the length of the course is 10 meters and the width (distance between the start and finish points) is 5 meters. Four cones were used to mark the start, finish and the two turning points. Another four cones were placed down the center an equal distance apart. Each cone in the center is placed 3.3 meters apart.

TEST PROCEDURE:

Warm up:

Subjects were made to do warm-up prior to the commencement of the test. Warm-up were corresponding to the biomechanical and physiological nature of the test. In addition, sufficient recovery (e.g. 3-5 minutes) was administered following the warm-up and prior to the commencement of the test.

Conducting the test:

Subjects were instructed to wear comfort clothing and proper foot wear (shoes).

Subjects were instructed to lie on their front (head to start line) and hands by their shoulders.

On the 'GO' command the stop watch is started, and the participant gets up as quickly as possible and runs around the course in the direction indicated, without knocking the cones over, to the finish line, at which the timing is stopped.

For the strength measurement isokinetic analyser was used. For the testing session, subjects were seated with power head orientation , power head tilt, and seat orientation set at 0º. The seat back tilt was set at 15º. Knee axis of rotation was determined by a line drawn in the sagittal plane through the femoral condyles. The subject was restrained when seated in the chair by two straps across the torso in a criss-cross fashion and by a strap placed across the thigh midway between anterior and superior iliac spine and superior border of the patella.

The standard knee-attachment device was secured to the leg so that the inferior border of the pad was placed on the superior border of the medial malleolus.

Once the subject was secured in the chair, the range-of motion limits were determined and set with goniometry. The starting position was 90º of knee flexion, and the endpoint was 0º of full knee extension. Gravity correction was performed for each limb before testing in order to reduce the risk of inaccurate data.

Once the subject was seated and secured in the chair, subjects were asked to perform 5 repetitions at 30º as a warm up.

Later subject was asked to perform the test 5 repetitions at 30º, 10 repetitions at 60º and 15 repetitions at 90º. A minute rest time was provided between the velocities.

PLYOMETRIC GROUP

After randomization 15 subjects were included into the plyometric group. The subjects will undergo 10 minute warm up protocol which includes 5 minute static stretching and 5 minute of jogging prior to training and ends up with 5 min cool down session.

- The exercises were shown and explained to the subjects in detail before starting the session.
- Subjects were instructed to wear comfort clothing and non slippery shoes.
- 60 seconds rest time was given after each set.

WEEKS	EXERCISES	SETS	REPETITIONS
1	Squat jump	4	6
	Side to side ankle hops	4	6
	Broad jump	4	6
2	Squat jump	5	6
	Side to side ankle hops	5	6
	Box jump	4	6
	Split squat jump	4	6

3	Split squat jump Single leg box jump Depth jump Lateral box jumps	5 5 4 4	6 6 6 6
4	Depth jumps Lateral box jumps Depth jump to broad jump Depth jump to vertical jump	5 5 4 4	6 6 6 6
5	Depth jump to broad jump Depth jump to vertical jump Single leg step up jumps Double leg to single leg broad jump	5 5 4 4	6 6 6 6
6	Single leg step up jump Double leg to single leg broad jump Depth jump to vertical jump Alternate leg stair bound	5 5 5 5	6 6 6 6

SPRINT GROUP

Before starting the session the subjects underwent 10 min warm up protocol 5 minute static stretching and 5 minute jogging prior to training and ends up the session with 5 min cool down exercises.

- Subjects instructed to wear comfort clothing and non slippery shoes.
- Before starting the session the running surface was marked and cones were placed for identification of running area.
- Subjects were instructed to stand at the starting line in their starting position and began to run after firing the gun and timing was measured with stop watch.
- 3 minute rest was given between each set and 1 minute rest time was given after each repetition.

WEEKS	EXERCISES	SETS	REPETITIONS
1	10 M sprint	3	3
2	10 M sprint	4	3
3	20 M sprint	3	3
4	20 M sprint	4	3
5	30 M sprint	3	3
6	30 M sprint	4	3

AFTER 6 WEEKS OF INTERVENTION:

1. Post values of peak torque of knee muscles was recorded for the subjects of both the groups by using Isokinetic analyser.
2. Agility was measured for the subjects of both the groups by using Illinois agility test.

RESULTS & STATISTICAL ANALYSIS:

The IAT and Peak torque data was entered into MS excel sheet and tabulated for statistical analysis. The pre and post values were analysed for both the groups, by using SPSS 22.0 version.

The outcome of this study: Illinois agility test and peak torque of knee musculature.

To compare the pre and post therapeutic values of within the group, simple t-test was performed. Paired t-test was performed between the IAT values of control and experimental groups. Descriptive measures like mean, standard deviation have been reported along with p-value.

TABLE 1: ANALYSIS OF PRE AND POST THERAPEUTIC MEAN VALUES OF THE ILLINOIS AGILITY TEST IN THE SPRINT GROUP AND PLYOMETRIC GROUP

	PRE-TEST VALUE		POST-TEST VALUE			
	Mean	Mean±STDEV	Mean	Mean±STDEV	t-Value	p-value
PLYOMETRIC GROUP	20.338	20.338±0.98	16.75467	16.75±1.03	16.73709	0.00
SPRINT GROUP	20.322	20.322±0.96	15.31	15.31±1.21	30.68104	0.00

RESULTS:

Pre and Post therapeutic values of the mean and standard deviation of the plyometric group are 20.338 ± 0.98 and 16.754 ± 1.03 respectively.

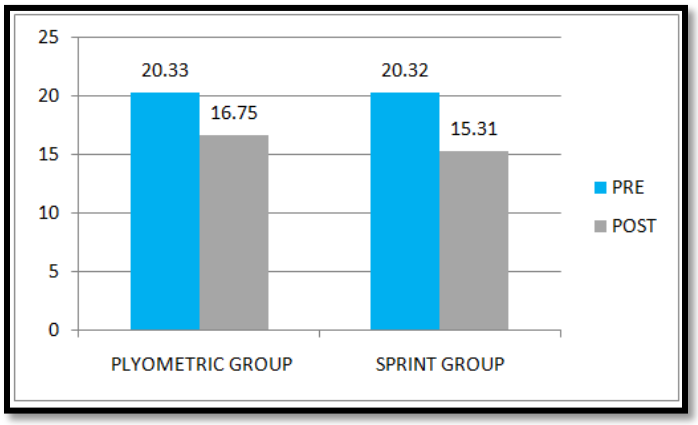
Pre and Post therapeutic values of the mean and standard deviation of the sprint group are 20.322 ± 0.96 and 15.31 ± 1.21 respectively.

INFERENCE:

On performing the paired t-test, there is a statistical significance ($p < 0.00$) existing between the pre and post therapeutic values of the sprint group and plyometric group.

The t-value of the IAT in the plyometric group was 16.737 and in the sprint group was 30.68 respectively.

GRAPHICAL REPRESENTATION OF THE PRE AND POST THERAPEUTIC MEAN VALUES OF THE IAT IN THE SPRINT AND PLYOMETRIC GROUP



GRAPHICAL REPRESENTATION OF THE PRE AND POST THERAPEUTIC MEAN VALUES OF THE PEAK TORQUE OF RIGHT LEG IN THE SPRINT GROUP

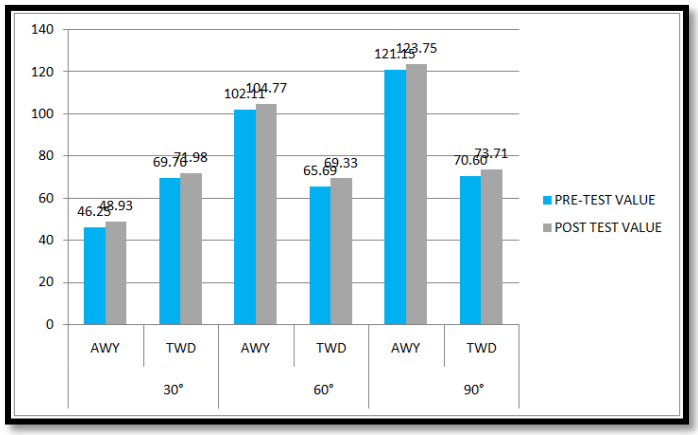


TABLE 2: ANALYSIS OF PRE AND POST THERAPEUTIC MEAN VALUES OF THE PEAK TORQUE OF RIGHT LEG IN SPRINT GROUP

		RIGHT					
		PRE-TEST VALUE		POST-TEST VALUE			
		Mean	SD	Mean	SD	t-Value	p-value
30°	AWY	46.24	19.52	48.92	19.21	14.97	0.0000
	TWD	69.76	25.34	71.98	25.46	18.62	0.0000
60°	AWY	102.106	34.80	104.76	34.54	10.13	0.0000
	TWD	65.68	18.54	69.32	18.47	12.67	0.0000
90°	AWY	121.14	36.96	123.75	36.78	17.18	0.0000
	TWD	70.6	15.65	73.71	15.77	26.69	0.0000

TABLE 3: ANALYSIS OF PRE AND POST THERAPEUTIC MEAN VALUES OF THE PEAK TORQUE OF LEFT LEG IN SPRINT GROUP

	LEFT						
		PRE-TEST VALUE		POST-TEST VALUE			
		Mean	Mean±STDEV	Mean	Mean±STDEV	t-Value	p-value
30°	AWY	52.83333	52.83±29.31	55.8	55.8±29.25	21.84419	0.0000
	TWD	78.74	78.74±26.664	81.23333	81.23±26.71	9.446648	0.0000
60°	AWY	108.7933	108.79±43.48	111.0667	111.06±43.276	14.5744	0.0000
	TWD	71.50667	71.5±20.35	74.06667	74.06±20.44	16.09004	0.0000
90°	AWY	120.0067	120±38.25	122.8467	122.84±38.32	15.71783	0.0000
	TWD	72.56667	72.56±19.07	75.35333	75.35±19.03	18.71225	0.0000

RESULTS:

Table -2 shows that the mean and standard deviation of post values of peak torque for sprint group of right leg of quadriceps (AWY) strength at 30°, 60°, and 90° has shown improvement when compared to the pre-values.

The mean and standard deviation of post values of peak torque for sprint group of right leg of hamstring (TWD) strength at 30°, 60°, 90°has shown improvement when compared to the pre values.

INFERENCE:

On performing the paired t-test, there was a statistical significance ($p<0.00$) existing within the pre and post therapeutic values for sprint group. The t-values of peak torque for sprint group of right leg ranges from 14.97 to 26.69.

RESULTS:

Table -3 shows that the mean and standard deviation of post values of peak torque for sprint group of left leg of quadriceps (AWY) strength at 30°, 60°, and 90° has shown improvement when compared to the pre-values.

The mean and standard deviation of post values of peak torque for sprint group of left leg of hamstring (TWD) strength at 30°, 60°, 90°has shown improvement when compared to the pre values.

INFERENCE:

On performing the paired t-test, there was a statistical significance ($p<0.00$) existing within the pre and post therapeutic values for sprint group. The t- values of peak torque for sprint group of left leg are 9.44 to 21.84 respectively.

GRAPHICAL REPRESENTATION OF THE PRE AND POST THERAPEUTIC MEAN VALUES OF THE PEAK TORQUE OF LEFT LEG IN THE SPRINT GROUP

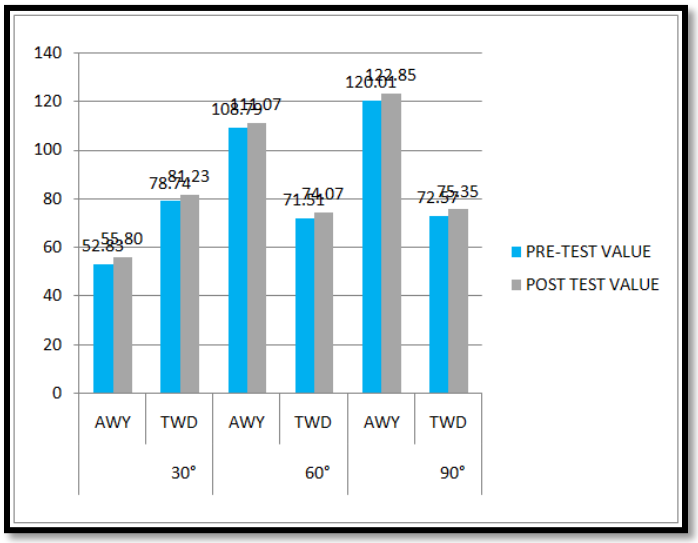


TABLE 4: ANALYSIS OF PRE AND POST THERAPEUTIC MEAN VALUES OF THE PEAK TORQUE OF RIGHT LEG IN PLYOMETRIC GROUP.

	RIGHT						
		PRE-TEST VALUE		POST-TEST VALUE			
		Mean	Mean±STDEV	Mean	Mean±STDEV	t-Value	p-value
30°	AWY	53.98	53.98±11.15	55.95	55.95±11.17	12.55	0.00
	TWD	79.21	79.21±22.43	81.25	81.25±22.26	19.18	0.00
60°	AWY	103.62	103.62±19.31	110.33	110.33±29.48	1.26	0.00
	TWD	76.93	76.93±15.84	78.46	78.46±15.7	11.75	0.00
90°	AWY	109.43	109.43±14.96	111.11	111.11±14.74	13.63	0.00
	TWD	75.46	75.46±14.09	77.60	77.6±13.82	17.57	0.00

RESULTS:

Table -4 shows that the mean and standard deviation of post values of peak torque for plyometric group of right leg of quadriceps (AWY) strength at 30°, 60°, and 90° has shown improvement when compared to the pre-values.

The mean and standard deviation of post values of peak torque for plyometric group of right leg of hamstring (TWD) strength at 30°, 60°, 90°has shown improvement when compared to the pre values.

INFERENCE:

On performing the paired t-test, there was a statistical significance (p<0.00) existing within the pre and post therapeutic values for sprint group. The t- value of peak torque for sprint group of right leg are 1.26 to 17.57 respectively.

GRAPHICAL REPRESENTATION OF THE PRE AND POST THERAPEUTIC MEAN VALUES OF THE PEAK TORQUE OF RIGHT LEG IN THE PLYOMETRIC GROUP.

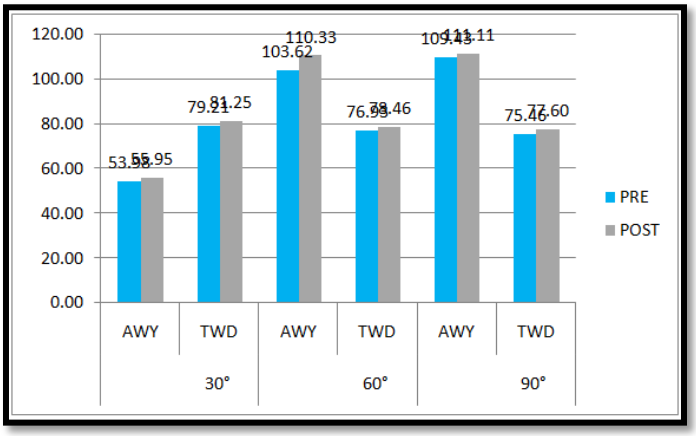


TABLE 5: ANALYSIS OF PRE AND POST THERAPEUTIC MEAN VALUES OF THE PEAK TORQUE OF LEFT LEG IN PLYOMETRIC GROUP.

	LEFT						
		PRE-TEST VALUE		POST-TEST VALUE			
		Mean	Mean±STDEV	Mean	Mean±STDEV	t-Value	p-value
30°	AWY	48.11	48.11±12.86	49.50	49.50±12.83	8.97	0.00
	TWD	80.70	80.7±19.84	82.21	82.21±19.77	14.49	0.00
60°	AWY	110.94	110.94±32.49	112.89	112.89±33.13	4.14	0.00
	TWD	73.27	73.27±16.39	74.78	74.78±16.35	10.88	0.00
90°	AWY	115.36	115.36±33.15	117.30	117.3±33.08	13.63	0.00
	TWD	89.49	89.49±24.8	91.31	91.31±24.89	13.63	0.00

RESULTS:

Table -5 shows that the mean and standard deviation of post values of peak torque for plyometric group of left leg of quadriceps (AWY) strength at 30°, 60°, and 90° has shown improvement when compared to the pre-values.

The mean and standard deviation of post values of peak torque for plyometric group of left leg of hamstring (TWD) strength at 30°, 60°, 90°has shown improvement when compared to the pre values.

INFERENCE:

On performing the paired t-test, there was a statistical significance (p<0.00) existing within the pre and post therapeutic values for sprint group. The t- value of peak torque for sprint group of left leg are 4.14 to 14.49.

GRAPHICAL REPRESENTATION OF THE PRE AND POST THERAPEUTIC MEAN VALUES OF THE PEAK TORQUE OF LEFT LEG IN THE PLYOMETRIC GROUP.

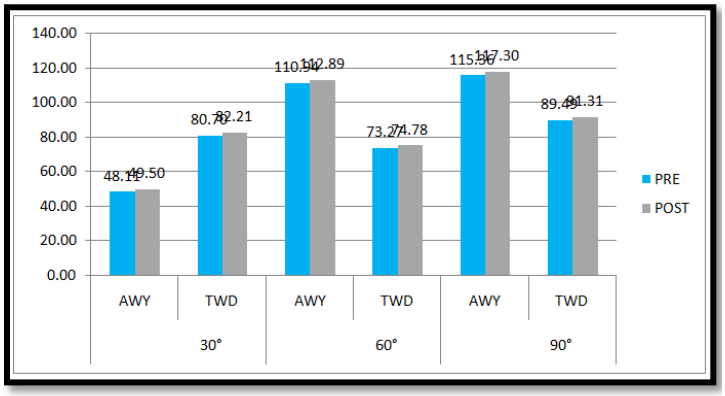


TABLE 6: POST MEAN VALUES OF PEAK TORQUE OF RIGHT LEG IN PLYOMETRIC GROUP AND SPRINT GROUP.

	RIGHT						
		Sprint group		Plyometric Group			
		Mean	Mean±STDEV	Mean	Mean±STDEV	t-Value	p-value
30°	AWY	48.93	48.92±19.21	55.95	55.95±11.17	-1.21	0.00
	TWD	71.98	71.98±25.46	81.25	81.25±22.26	-0.90	0.00
60°	AWY	104.77	104.76±34.54	110.33	110.33±29.48	-0.40	0.00
	TWD	69.33	69.32±18.47	78.46	78.46±15.7	-1.28	0.00
90°	AWY	123.75	123.75±36.78	111.11	111.11±14.74	1.16	0.00
	TWD	73.71	73.71±15.77	77.60	77.6±13.82	-0.85	0.00

RESULTS:

Table - 6 shows that post mean values of both the groups have showed significant improvement when compared to the pre values.

INFERENCE:

On performing the paired t-test, there was a statistical significance ($p<0.01$) existing within the post and post intervention values for plyometric group and sprint group. The t- value of peak torque for plyometric group and sprint group are ranging from – 0.40 to 1.26 respectively.

By these values we can find that there is a significant improvement in both the groups but there is more improvement observed in core plyometric group than the sprint group.

GRAPHICAL REPRESENTATION OF POST MEAN VALUES OF PEAK TORQUE OF RIGHT LEG IN PLYOMETRIC GROUP AND SPRINT GROUP.

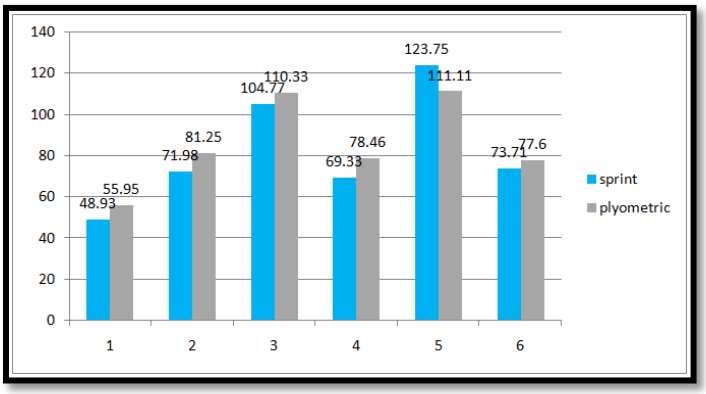


TABLE 7: POST MEAN VALUES OF PEAK TORQUE OF LEFT LEG IN PLYOMETRIC AND SPRINT GROUP.

	LEFT						
		Sprint group		Plyometric Group			
		Mean	Mean±STDEV	Mean	Mean±STDEV	t-Value	p-value
30°	AWY	55.80	55.8±29.25	49.50	49.50±12.83	0.75	0.00
	TWD	81.23	81.23±26.71	82.21	82.21±19.77	-0.09	0.00
60°	AWY	111.07	111.06±43.276	112.89	112.89±33.13	-0.11	0.00
	TWD	74.07	74.06±20.44	74.78	74.78±16.35	-0.10	0.00
90°	AWY	122.85	122.84±38.32	117.30	117.3±33.08	0.47	0.00
	TWD	75.35	75.35±19.03	91.31	91.31±24.89	-2.87	0.00

RESULTS:

Table - 6 shows that post mean values of both the groups have showed significant improvement when compared to the pre values.

INFERENCE:

On performing the paired t-test, there was a statistical significance ($p<0.01$) existing within the post and post intervention values for plyometric group and sprint group. The t- value of peak torque for plyometric group and sprint group are ranging from – 0.09 to 0.75 respectively.

By these values we can find that there is a significant improvement in both the groups but there is more improvement observed in core plyometric group than the sprint group.

GRAPHICAL REPRESENTATION OF POST MEAN VALUES OF PEAK TORQUE OF LEFT LEG IN PLYOMETRIC GROUP AND SPRINT GROUP.

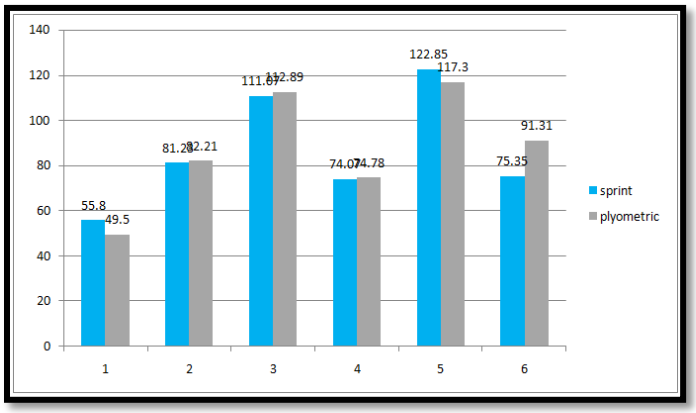


TABLE 8: POST MEAN VALUES OF IAT IN PLYOMETRIC AND SPRINT GROUP.

GROUP-1 PLYOMETRIC GROUP		GROUP-2 SPRINT GROUP			
Mean	Mean±STDEV	Mean	Mean±STDEV	T value	P-value
16.75467	16.75±1.03	15.31	15.31±1.21	0.83	0.00

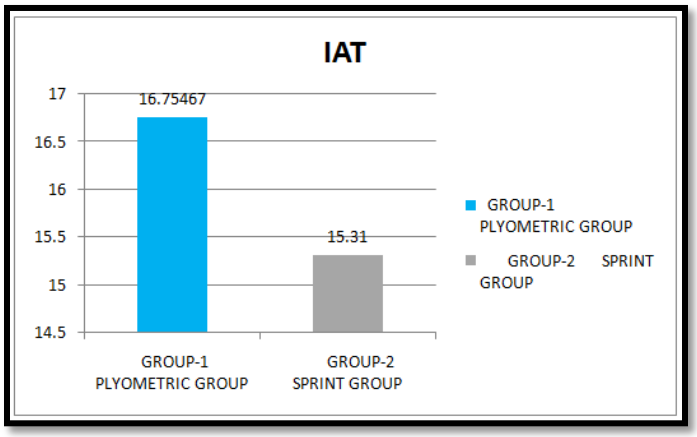
RESULTS:

Table - 6 shows that post mean values of both the groups have showed significant improvement when compared to the pre values.

INFERENCE:

On performing the paired t-test, there was a statistical significance ($p<0.01$) existing within the post and post intervention values for plyometric group and sprint group. The t- value of peak torque for plyometric group and sprint group is 0.83 respectively.

GRAPHICAL REPRESENTATION OF POST MEAN VALUES OF PEAK TORQUE OF LEFT LEG IN PLYOMETRIC GROUP AND SPRINT GROUP.



DISCUSSION

The aim of the present study is to known the influence of plyometric training and sprint training on agility and strength of knee musculature in male collegiate cricket players.

As per the inclusion criteria, 30 male players were taken into the study and randomly allocated into two groups. Group -I with 15 male players underwent plyometric training for 6 weeks and in Group-II, 15 male players underwent sprint training for a period of 6 weeks. IAT and peak torque are the outcome measures. Values are measured before the start of training on the first day and at the end of training after 6 weeks.

Results of table shows that pre and post values of IAT in sprint and plyometric group has shown significant improvement after plyometric and sprint training.

A study conducted by Vadivelan et al. on 30 male collegiate players on agility and anaerobic power, between two groups namely plyometric and sprint group shows that there is improvement in agility after 6 week plyometric training[3].

A study done by Mantu baro et al. concluded that there was significant improvement in agility after 6 week plyometric training[10].

A study done by Dennis peter born stated that sprint training improves the reactive agility and change of direction speed[11].

results of table 2 and 3 shows that there was improvement in the strength of knee musculature in the sprint group after 6 week sprint training.

Josh in his article stated that, Sprint training will add muscle mass in two key ways: First, sprinting targets Type II or 'fast twitch' muscle fibers in the legs. These fibers are associated with increases in muscle size and mass. Studies show that for this reason alone, sprint training can increase muscle size and strength. Second, sprinting has been shown to increase protein synthesis and growth hormone production; both of which are essential for recovery and growth[12]

Patrick Hutchison in his study stated that sprinting is an anaerobic exercise, it works to build the muscle same as weight training that produces short bursts of energy that increase muscle strength However, unlike most weightlifting exercises, sprinting uses dozens of muscles at the same time, making it one of the most complete muscle training exercise[13].

Goran markovic et al. in his study stated that effects of sprint and plyometric training on muscle function and athletic performance stated that 10- week sprint training significantly improved leg extensor strength and power, as well as SSC muscle function. In their study they also found that sprint training produces similar or greater training effects than does plyometric training[14].

Results of table 4 and 5 shows that there was improvement in the strength of knee musculature in the plyometric group after 6 week plyometric training.

Arunpandiyan et al. in his study on the effect of plyometric exercises on strength, stated that plyometrics are useful in improving the arm strength and leg strength. in the study they also stated that the ability to rapidly apply force (reactive force) is the major goal of plyometric training. Plyometrics are used to apply an overload to the muscles with speed strength as goal[15].

In a study done by Namrata N. patel concluded that the plyometric training can be safely introduced to improve vertical jump ability, speed-strength and power and reduce chances of sports specific injury[16].

Results of table 6 and 7 shows that there is significant improvement in both the groups but more improvement was observed in plyometric group than the sprint group.

Plyometric training utilizes the elastic and proprioceptive properties of a muscle to generate maximum force production by stimulating mechanoreceptors to facilitate an increase in muscle recruitment in a minimal amount of time. Muscle spindles and Golgi tendon organs (GTOs) provide the proprioceptive basis for plyometric training. The central nervous system then uses this sensory information to influence muscle tone, motor execution, and kinesthetic awareness. Stimulation of these receptors can cause facilitation, inhibition, and modulation of both agonist and antagonist muscle activity. This enhances neuromuscular efficiency and functional strength[7].

Results of table 8 shows that there is significant improvement in both the groups but more improvement was observed in plyometric group than the sprint group.

Michael G. Miller, in his study stated that a 6 week plyometric training can be useful in the improvement of agility, and also mentioned that the improvement in the players may be due to either better neuronal recruitment or neural adaptations and also mentioned that the relationship between plyometric exercise and increased performance in agility tests may be high due to their similar patterns of movement to facilitate power and movement efficiency by the immediate change in direction upon landing[17].

Rather than imparting plyometric and sprint training separately, combined training of sprint and plyometrics may induce more benefits.

In a study done by Hassan almoslim concluded that the training program had more effect for the combined plyometric and sprint training group than the combined plyometric and resistance training group in agility and standing long jump, but has similar consequences in speed constituents[18].

Goran markovic in his study stated that the findings of the research indicate that sprint running can also be used effectively as a training method for improving explosive leg power and dynamic athletic performance. Therefore, in addition to the well-known training methods such as resistance training and plyometric training, strength and conditioning professionals may well incorporate sprint training into an overall conditioning program of athletes striving to achieve a high level of explosive leg power and dynamic athletic performance[14].

CONCLUSION

After the 6 weeks of intervention, there was improvement of strength of knee musculature and agility in both the sprint and plyometric groups.

However, there was significant improvement of strength of knee muscles and agility in plyometric group than the sprint group.

LIMITATIONS

- Only male cricket players were included
- Elite players could also be included.
- This study was done on a smaller sample size of 30 subjects.
- This study was done for a short duration of 6 weeks

RECOMMENDATIONS

- Both the genders can be included.
- Further studies can be recommended over large samples and longer durations.
- Further studies are recommended to improve agility and strength by using other protocols.
- Studies can be done on other age group and other level of players

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