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Effect of High Intensity Interval Training on Selected Physical Fitness and Performance Variables Among College Men Sprinters

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ABSTRACT

This study sought to determine how high-intensity interval training affected specific physical fitness and performance metrics in male collegiate sprinters. To execute the present study the research investigator, select 15 college men sprinters from KMG College of Arts and science and Govt Thirumagal mills College of Arts and science Gudiyattam Vellore Dist. The training group namely interval training group underwent their training program for 8 weeks. Alternative days the work out lasted for 45 to 60 minutes including warm-up and warm-down exercises. The subjects underwent their training program apart from their regular routine. The selected Physical fitness variables namely speed and Agility, and performance variables namely 100m and 200m are dependent variables. Independent variable was High Intensity Interval Training. To determine the significant difference between pre and post test the statistical procedure namely paired "t" test was applied. To test the level of significance the 0.05 level was fixed. The results of the information analysis showed that the use of High Intensity Interval Training greatly enhanced the chosen dependent variable, namely Speed Agility 100m and 200m.

Keywords: *High Intensity Interval Training, Speed, Agility, Sprinting.*

1. INTRODUCTION

Physical Education plays an important role in educational process by emphasizing on building a physically, emotionally, mentally and socially fit society. Man is a unity; the division of his body (physical) and intellect (mental) would result in the extinction of the creature [1].

Physical education is the phase of education that use large muscle activities and their related responses. A great deal of time and effort is now going into scientific laboratory research in physical education particularly in the fields of physiology and psychology as they affect the teaching and learning of neuromuscular and sports skills [2]. A country's greatness is primarily determined by people's efficiency, physical fitness, and general health. An essential component of the entire educational process is physical education. Which aim the improvement of human performances through the use of physical activities in order to achieve this goal. An individual can achieve optimal physical, mental, and social health and fitness through physical activities through the process of exercise education [3].

2. INTERVAL TRAINING

Exercise that alternating between increasing and decreasing intensity is known as interval training. Compared to one continuous high-intensity workout, interval training enables you to train at a higher level for longer periods of time. In my opinion, intermittent running is the most crucial type of physical activity for all athletes, regardless of skill level. You receive greater time/strength results from interval training than from any other method, but remember to perform protection Speed [4].

Interval training is a type of intermittent physical exercise that involves a series of low or high intensity exercises with periods of rest or relief. The bar diagram shows the average speed test results before and after.

One way to characterize interval training is as brief bursts of effort interspersed with rest. Enhancing cardiovascular fitness and speed is the primary goal.

Any type of cardiovascular exercise, such as cycling, jogging, rowing, etc., can be referred to as interval training, which is common in many sports' training regimens. Although runners are the only ones who practice this strategy, athletes from a wide range of backgrounds have been known to employ this kind of training.

Types of interval training

- **The Anaerobic Phases**. Recovery is the primary distinction between anaerobic and aerobic phases. Because the recovery time for aerobic intervals is strictly controlled, each interval starts when aerobic stress is still present. The duration of the complete recuperation from anaerobic periods is typically significantly longer than the overall length of the interval. Usually lasting two minutes or less, the interval is extremely intense.
- **Aerobic Intervals.** Many runners believe that when they hear the term "interval training." These are often high-perceived-exertion runs lasting 1–8 minutes that are repeated across 3-6 miles. 1:1 recovery is frequently employed for longer durations (5+ minutes). Shorter time frames have disproportionately shorter returns (half the time frame or less). Any reasonably level surface that can be marked with lengths would work, though typically a defined distance—like a track—is utilized [5].
- **High Intensity Interval Training:** High Intensity Interval Exercise, sometimes referred to as sprint interval training or high intensity intermittent exercise, is a more complex type of cardio workout which alternates short bursts of severe anaerobic exercise with less intense recovery times. Interval training at high intensities is a type of cardiovascular exercising. The duration of high-intensity interval training can vary from four to thirty minutes. These quick, high-intensity workouts enhance fat burning, glucose metabolism, and athletic performance and fitness. High-intensity interval training often consists of a warm-up period followed by three to ten high-intensity bouts of exercise separated by a moderate-intensity recovery period and ending with a cool-down period. High-intensity exercise should be performed at maximum capacity. Moderate exercise should be around 50% intensity. The number and length of repetitions depends on the exercise, but for a 20-second intense exercise, it can be up to three times [6].

Moderate effort might be as slow as strolling, depending on your cardiovascular development. The standard formula calls for a 2:1 work-to-recovery ratio, such as 30–40 seconds of intense sprinting followed by 15–20 seconds of walking or jogging.

The entire High intensity interval training a session can last anywhere from four to thirty minutes, which means it's considered a great way to maximize your timed workout.

This workout consists of times of exertion interspersed with less strenuous rest intervals. Running intervals, which include around thirty seconds of exertion after a few seconds of jogging or walking are a well-known example of HIIT. Although the rest periods are often around twice as long as those during the more strenuous phase, they obviously vary based on the level of fitness. These workouts can range from four seconds to around 20 minutes in length, according to your level of train and the amount of times that you repeat the cycle. You next repeat that procedure for a predetermined period of time [7].

3. LITERATURE REVIEW

Fernandez et al. [9] introduced High-intensity interval training vs. repeated-sprint training in tennis. Effects of body weight loss and sprint interval training on experienced cyclists' power to weight ratio. This study sought to ascertain how peak and average anaerobic power to weight ratios were affected by supramaximal sprint interval training (SIT), body weight reduction, and a combination of the two therapies. The findings show that body weight reduction and SIT sessions can be used as stand-alone training interventions by cyclists.

Ziemann et al. [10] designed Aerobic and anaerobic changes with high-intensity interval training in active college-aged men. Changes in anaerobic and aerobic capacity in active college-aged men through high-intensity interval training. Venous samples were taken at rest and five and fifteen minutes after the Wingate test, and they were then analyzed for lactate (LA) at the antecubital vein. The authors do not support the protocol as the sole means of rapidly demonstrating significant gains in anaerobic and aerobic performance based on the results reported here.

Zuniga et al. [11] proposed Physiological responses during interval training with different intensities and duration of exercise. This study compared four interval training (IT) sessions with different exercise intensities and durations to determine the effects on fatigue biomarkers such as blood lactate concentration (BLC), rating of perceived exertion, mean V_O2, total V_O2, and duration of exertion (95% MPO).

Khaled et al. [12] introduced Effects of traditional aerobic exercises versus sprint interval training on pulmonary function tests in young sedentary males: a randomized controlled trail. In recent years, a worldwide non-communicable disease is physical inactivity. to assess how young, sedentary men's Vital Capacity (VC), Maximum Voluntary Ventilation (MVV), and Physical Fitness Index (PFI) are affected by Sprint Interval Training (SIT) and traditional aerobic exercise (AE). Sprint interval training can enhance lung functions and the Physical Fitness Index, according to the current study.

4. METHODOLOGY

Examining the impact of interval training on specific physical fitness and performance metrics in male collegiate sprinters was the aim of this study. To achieve this purpose, 15 sprinters were selected as subjects from K.M.G College of Arts and Science and Govt Thirumagal Mills College Gudiyattam, The procedure adopted for the selection of subjects, selection of variables, orientation of the subjects, reliability of data, collection of data, instrument's reliability, tester's reliability, test administration, training schedule, experimental design and statistical techniques employed for analyzing the data have been described in this chapter.

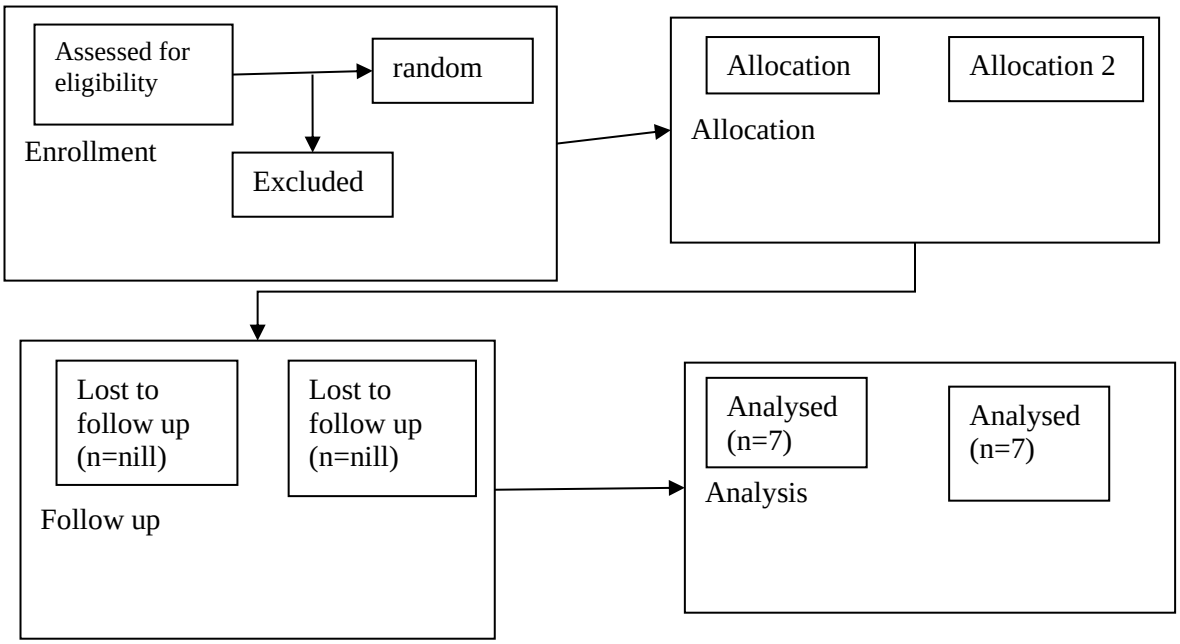

Figure 1. Flow diagram

According to Janet D. Elashoff's 2007 Query Advisor Version 7.0, Statistical Solutions, Cork, Ireland, there should be six people in each group. The study should have 80% power, a single-tailed hypothesis, and α at 0.05. This was computed to estimate the key outcome measure's effect size to be 2. To allow for loss to follow-up, seven subjects per group were enrolled; these are shown in Fig. 1.

5. TRAINING SCHEDULE

Each training session was started with light warm-up and ended with warm down exercise.

- Duration of phase 8 weeks.
- Total time of interval training session 45-60 minutes
- Monday, Wednesday and Friday.

AGILITY DRILLS

- Shuttle Run- A fitness test called a shuttle run is used to gauge your level of speed, agility, and endurance. It's a simple workout that involves running steadily back and forth between two locations.
- Baby hurdle jump- Cones, low barriers, or even pillows spread out on the floor are some examples of the hurdles or obstacles that must be set up in a certain play area in order to play the game.
- Forward backward Sprint- The phrase describes a set amount of time during which a group will strive to achieve particular objectives. Sprints are often quite brief, however this time frame can be of any duration.
- Tuck jump- The tuck position is a type of sitting position in which the knees are brought or pressed towards the chest and both legs are bent at the hips and knees.
- Stair running -The horizontal distance a staircase travels, including all treads but usually excluding the landing, is referred to as a "stair run."

ACCELERATION DRILLS

- Prowler march- By completing brief, high-intensity sprints that last anywhere from a few seconds to two minutes, the Prowler sled enables you to enhance your anaerobic conditioning.
- Push up starts- One popular calisthenics exercise is the push-up, often known as the press-up in British English. Push-ups work the pectoral muscles by utilizing the arms to raise and lower the body.
- Jump back start- Anaerobic workouts that require rapid energy bursts include leap back exercises. Your metabolism, bone density, strength, muscle tone, balance, coordination, and cardiovascular health can all be enhanced by them.

SPEED DRILLS

- High knee action- The run-in-place exercise and pronounced knee lifts are combined to create the high knees workout.
- Butt kicks- It is intended to strengthen all of the lower body's muscles.
- Resisted running- It entails running exercises and sprints while working against a resistive force, like an elastic band, sled, or parachute.
- Galloping- With a slight spring, the front foot advances, and then the body weight shifts to the back foot, creating a forward slide motion.
- High knee kicks- It will incorporate running in the same spot while bringing the knees as close to the chest as possible.

TABLE 1. WEEK: 1 Training Plan for Speed and Agility Development

	MONDAY	**WEDNESDAY**	**FRIDAY**
WORK	Agility & Acceleration	Speed	Agility & Speed Endurance
DISTANCE	10m sprint	40 m sprint	20 m sprint
RECOVERY	60 seconds	3 minute	1:1 work/rest ratio
BOUTS	8 repetitions	6 repetitions	10 repetitions

TABLE 2. WEEK: 2 Training Plan for Speed and Agility Development

	MONDAY	**WEDNESDAY**	**FRIDAY**
WORK	Agility & Acceleration	Speed	Agility & Speed Endurance
DISTANCE	15m sprint	50 m sprint	25 m sprint
RECOVERY	60 seconds	3 minute	1:1 work/rest ratio
BOUTS	8 repetitions	8 repetitions	10 repetitions

TABLE 3. WEEK: 3 Training Plan for Speed and Agility Development

	MONDAY	**WEDNESDAY**	**FRIDAY**
WORK	Agility & Acceleration	Speed	Agility & Speed Endurance
DISTANCE	20m sprint	60 m sprint	30 m sprint
RECOVERY	90 seconds	4 minute	1:1 work/rest ratio
BOUTS	10 repetitions	8 repetitions	10 repetitions

TABLE 4. WEEK: 4 Training Plan for Speed and Agility Development

	MONDAY	WEDNESDAY	FRIDAY
WORK	Agility & Acceleration	Speed	Agility & Speed Endurance
DISTANCE	20m sprint	70 m sprint	35 m sprint
RECOVERY	90 seconds	5 minute	1:2 work/rest ratio
BOUTS	10 repetitions	8 repetitions	10 repetitions

TABLE 5. WEEK: 5 Training Plan for Speed and Agility Development

	MONDAY	WEDNESDAY	FRIDAY
WORK	Agility & Acceleration	Speed	Agility & Speed Endurance
DISTANCE	25m sprint	80 m sprint	40 m sprint
RECOVERY	2 minute	6 minute	1:2 work/rest ratio
BOUTS	10 repetitions	8 repetitions	10 repetitions

TABLE 6. WEEK: 6 Training Plan for Speed and Agility Development

	MONDAY	WEDNESDAY	FRIDAY
WORK	Agility & Acceleration	Speed	Agility & Speed Endurance
DISTANCE	25m sprint	90 m sprint	45 m sprint
RECOVERY	2 minute	7 minute	1:2 work/rest ratio
BOUTS	10 repetitions	10 repetitions	10 repetitions

TABLE 7. WEEK: 7 Training Plan for Speed and Agility Development

	MONDAY	WEDNESDAY	FRIDAY
WORK	Agility & Acceleration	Speed	Agility & Speed Endurance
DISTANCE	30m sprint	100 m sprint	50 m sprint
RECOVERY	3 minute	7 minute	1:3 work/rest ratio
BOUTS	10 repetitions	10 repetitions	10 repetitions

TABLE 8. WEEK: 8 Training Plan for Speed and Agility Development

	MONDAY	WEDNESDAY	FRIDAY
WORK	Agility & Acceleration	Speed	Agility & Speed Endurance
DISTANCE	30 m sprint	110 m sprint	50 m sprint
RECOVERY	3 minute	8 minute	1:3 work/rest ratio
BOUTS	10 repetitions	10 repetitions	10 repetitions

A systematic training program emphasizing agility, speed, and endurance is shown in the tables above, with particular drills, distances, recovery times, and repetitions for every session.

6. RESULTS OF THE STUDY

Forced Vital Capacity and Maximum Voluntary Ventilation improved more in the sprint interval training group, though the difference was not statistically significant. Still, given that the time commitment was only 30 minutes as opposed to 150 minutes per week for traditional aerobic exercise, it seemed like a better choice. Additionally, compared to traditional aerobic exercise, sprint interval training resulted in a statistically significant improvement in the Physical Fitness Index.

TABLE I: 'T' RATIO FOR COMPARING THE SIGNIFICANT DIFFERENCE BETWEEN PRE AND POST TEST OF SPEED

Test	Average set of values	MD	SD	Standard Error of Mean	DF	"t"	Table value
Pre test	6.85	0.20	.32	.083	14	4.04	2.14
Post test	6.65		.34	.090			

** Significant at 0.05 level of confidences*

It was established that there was a considerable variation in speed between the pre-test and post-test, as Table I demonstrates that the acquired "t" ratio of 4.04 was higher above the reported value of 2.04.

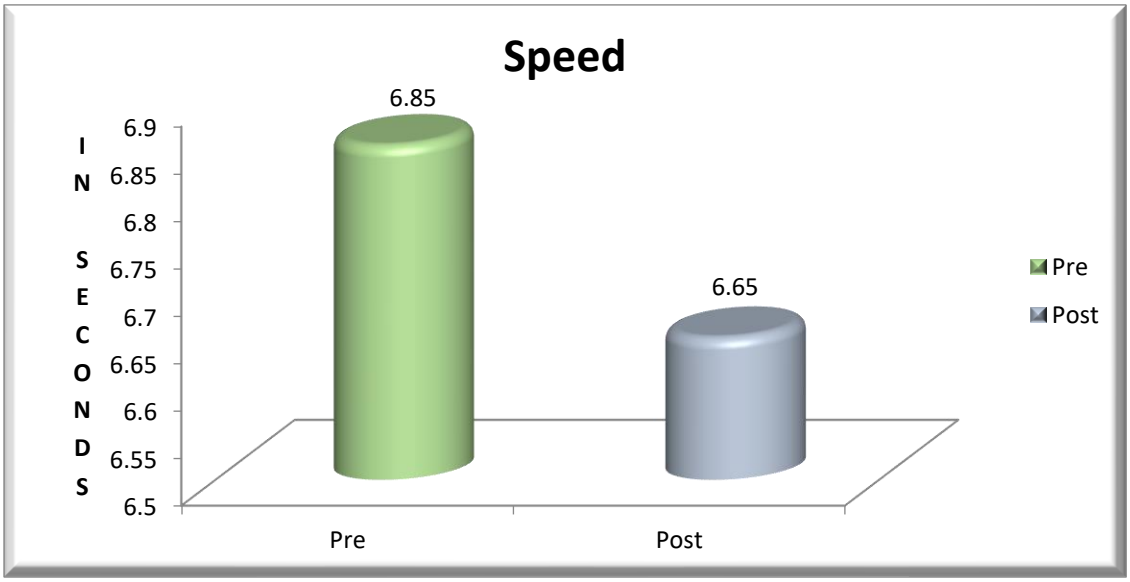

FIGURE I: THE MEAN VALUES OF THE PRE AND POST TESTS FOR SPEED ARE DISPLAYED IN THE BAR DIAGRAM.

The speed in seconds before (Pre) and after (Post) an intervention is contrasted in this bar chart. Better performance was indicated by the time decreasing from 6.85 seconds (Pre) to 6.65 seconds (Post).

TABLE II: 'R' RATIO FOR COMPARING THE SIGNIFICANT DIFFERENCE BETWEEN PRE AND POST TEST FOR AGILITY

Test	Average set of values	MD	SD	Standard error of mean	DF	"r"	Table value
Pre test	15.76	.22	0.49	0.12	14	4.94	2.15
Post test	15.54		0.55	0.14			

** Significant at 0.05 level of confidences*

Table II demonstrates that there was a substantial difference between the agility pre-test and post-test, with the obtained "r" ratio 4.94 being above the table's value 2.15.

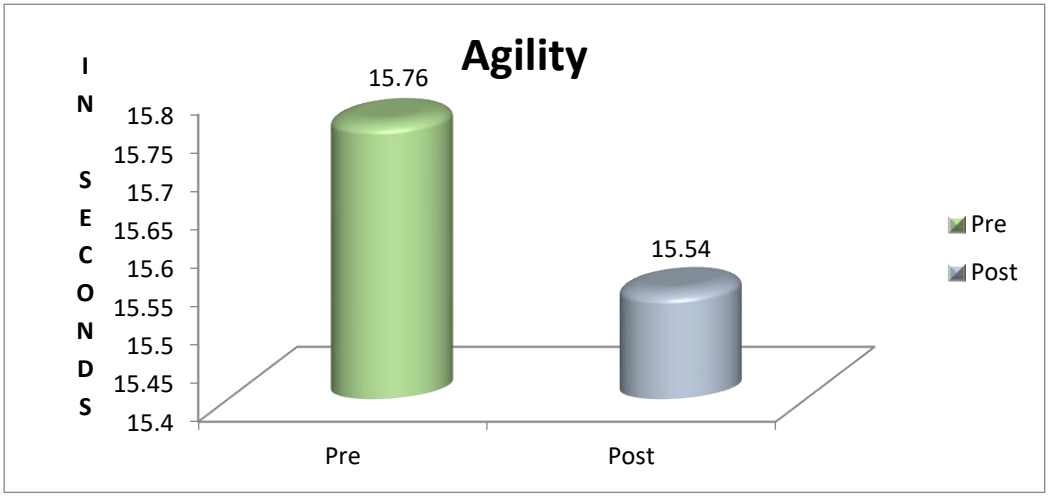

FIGURE II: BAR DIAGRAM SHOWS THAT THE MEAN VALUES OF PRE AND POST TEST OF AGILITY

The agility in seconds before (Pre) and after (Post) an intervention is contrasted in this bar chart. Better performance was indicated by the time decreasing from 15.76 seconds (Pre) to 15.54 seconds (Post).

TABLE III: 'S' RATIO FOR COMPARING THE SIGNIFICANT DIFFERENCE BETWEEN PRE AND POST TEST 100 METERS

Test	Average set of values	MD	SD	Standard error of mean	DF	"s"	Table value
Pre test	13.31	.26	.79	.205	14	4.19	3.72
Post test	13.04		.89	.229			

* Significant at 0.05 level of confidences

It was demonstrated that there was a substantial difference between the pre-test and post-test of 100 meters, as Table III

demonstrates that the acquired S ratio 4.19 was significantly greater than the chart's value 3.72.

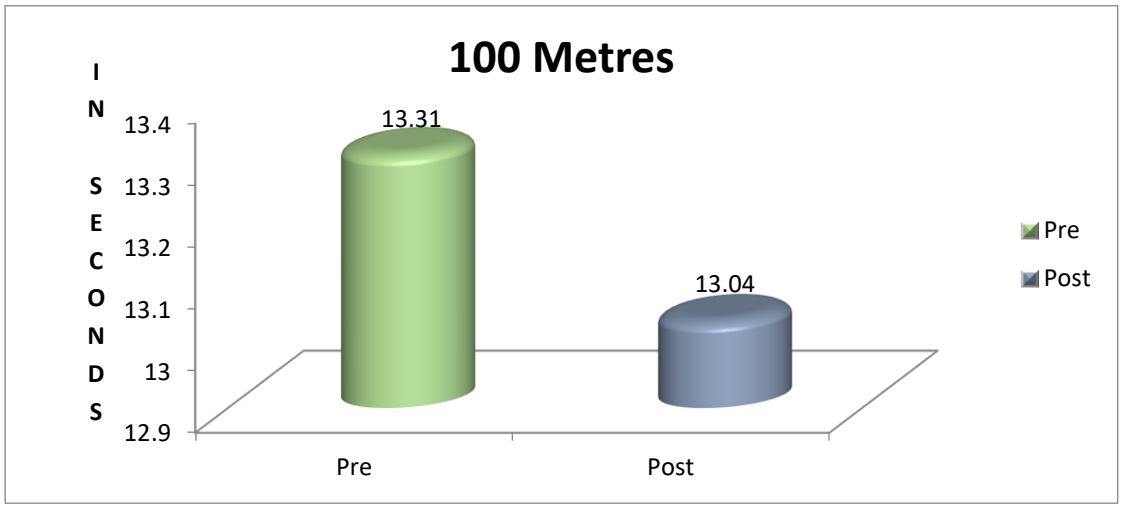

FIGURE III: THE MEAN VALUES OF THE PRE- AND POST-TEST OF 100 METERS ARE DISPLAYED IN THE BAR DIAGRAM.

This bar chart compares the distance in seconds before (Pre) and after (Post) an intervention. The timing dropped from 13.31 seconds (Pre) to 13.04 seconds (Post), indicating better performance.

TABLE IV: 'T' RATIO FOR COMPARING THE SIGNIFICANT DIFFERENCE BETWEEN PRE AND POST T TEST OF 200 METERS

Test	Mean	MD	SD	Standard error of mean	DF	"t"	Table value
Pre test	27.96	0.46	1.92	.49	14	3.71	2.14
Post test	27.50		2.06	.53			

* Significant at 0.05 level of confidences

It was demonstrated that there was a substantial difference between the 200-meter pre-test and post-test, as indicated by Table IV, which displays that the acquired T ratio 3.71 was higher than the table value 2.14.

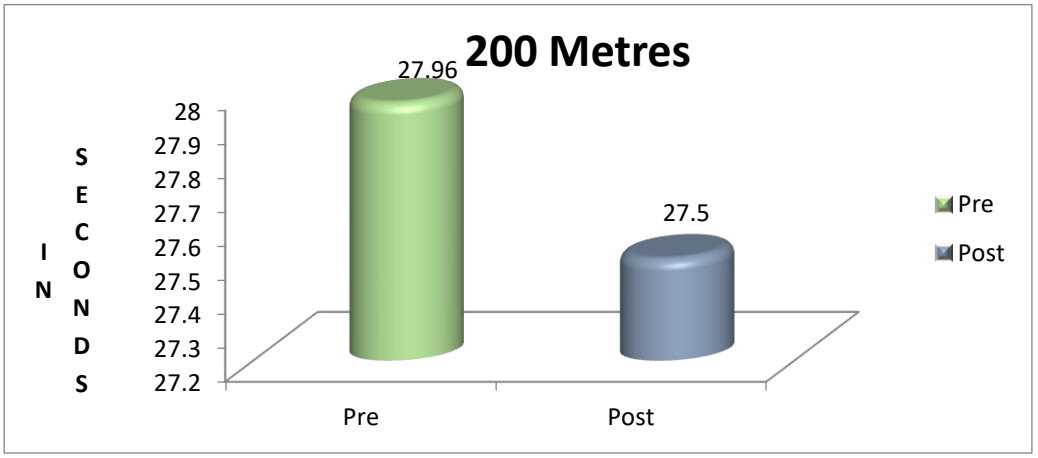

FIGURE IV: THE MEAN VALUES OF THE PRE AND AFTER TESTS OF 200 METERS ARE PRESENTED IN THE BAR DIAGRAM.

The distance in seconds before (Pre) and after (Post) an intervention is contrasted in this bar chart. Better performance was indicated by the time, which decreased from 27.96 seconds (Pre) to 27.5 seconds (Post).

7. DISCUSSION ON FINDINGS

The study's findings show that eight weeks of high-intensity interval training significantly improved speed agility as well as 100 and 200-meter performances on a few physical and performance metrics. Based on the studies in the literatures that suggest that exercises such as Speed Drills Agility drills and Acceleration Drills along with work rest ratio.

8. CONCLUSION

Collected data were statistically assessed through paired 'T' ratio and the following results were made.

PHYSICAL FITNESS VARIABLES

SPEED

The "t" value that was obtained is greater than the value found in the table. As a result, it was demonstrated that speed had significantly improved.

AGILITY

The "t" value that was obtained is greater than the value found in the table. Thus, it was demonstrated that agility had significantly improved.

PERFORMANCE VARIABLES

100 METERS

The "t" value that was obtained is greater than the value found in the table. As a result, it was demonstrated that the 100-meter course had significantly improved.

200 METERS

The "t" value that was obtained is greater than the value found in the table. Thus, it was demonstrated that the 200-meter course had significantly improved.

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