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COMPARISON OF LEG STRENGTH, ABDOMINAL STRENGTH AND SELECTED PHYSIOLOGICAL PARAMETERS OF SPRINTERS AND LONG DISTANCE RUNNERS

Vidya Kumari
Research Scholar, MATS University, Raipur, India.

ABSTRACT

The purpose of this study was to compare the leg strength, abdominal strength, selected physiological parameters of sprinters and long distance runners. Total 24 male and female athlete were selected as subjects. The criteria measure selected for the purpose of the study were broad jump in cms, sit-up in 60 sec, vital capacity in ml, breath hold capacity in sec.The data pertaining to each of the selected physical components of inter collegiate player were examined by ANOVAfollowed by post-hoc-LSD. Result depicted significant difference among the different type of athletes. In conclusion, significant relationship was witnessed between types of athletic activity and physical and physiological variables of athlete.

KEYWORDS: *sprinters, long distance runner, leg strength, abdominal strength, vital capacity, breath holding capacity.*

INTRODUCTION

Long distance runners and sprinters both try to win the races. In the sport of track and field, sprinting and distance running represent two major categories of athletes. Sprinting is associated with power and speed, whereas distance running focuses on the economy of movement. With distance running, there are elements of sprint technique that overlap. With distance events, there comes a time near the end of the race where economy gives way to speed. If the distance runners knew how to alter their technique in a way to become more sprint-like, this process could possibly be more successful.

Running is one of the most natural activity of athlete. Any training, conditioning program, fitness test contains running.Distance runners form is fluid and economical with little wasted motion. The foot-strike is often near the heel in an effort to absorb impact, and the feet are lifted no higher than necessary to complete each stride. Little vertical oscillation is found among distance runners, while arm motion is primarily for proper counterbalance (Williams and Cavanagh, 1987).Sprinting focuses on power, explosiveness and top speed. The use of the body centers on the development of force, and the effort is highly intense. The body type of sprinters is also dramatically different from their sinewy distance counterparts. Sprinters exhibit a much larger muscle mass, more capable of high speed and rapid acceleration.Sprinters are clearly differentiate from endurance athletes. Simply look at their physiques and note the remarkable muscle bulk of the sprinter in the key prime movers especially. What in a sport or selective hypertrophy in the major prime movers of the sprint athlete. In contrast, the endurance athlete does not display such muscle hypertrophy(Brandon and Boileau, 1992).

Breathing is an important aspect of sports. Every sports man has to learn to breathe properly. Controlling the breath cannot come easily unless one practices and develop capacities for full utilization of available oxygen in each breath. By practicing breath control one may develop greater tolerance by checking respiratory stimulation as well as developing capacities for fuller utilization of available oxygen in each breath (Derikachan,1980).

Lung capacity is important for athlete. It can be improved over time by consistent work out and exercising. Sports performance can be affected without enough oxygen. All the athlete should improve their lung capacity over time. Exercising over timeand period are the best ways to increase lung capacity. Such exercises are also good for the cardiovascular system.Deep breathing will help to improve lung capacity over time(Rathi,2014). The lung capacity also affected by the altitude. People from higher altitudes have a higher lung capacity and red blood count. A systematic altitude training is required to improve the lung capacity. It can be dangerous to train at very high altitudes and train hard. It may result in altitude sickness.The various lung volumes measured under resting conditions for the most part are larger in trained then an untrained man. The same holds true for women. The majority of these changes can be attributed to the fact that training results in improved pulmonary function ant therefore in larger lung volumes (Bowers and Foss, 1998).

Cardiovascular fitness is improved by increased lung capacity. Cardiovascular fitness is the body's ability to deliver oxygen to the working muscles and remove waste products. If the lungs take in more oxygen with each breath, the body receives its oxygen supply and gets rid of its waste supply without putting extra stress on the heart to work faster. If a person maintains lung capacity, the heart must beat more frequently to increase circulation in order to get more oxygen to the working muscles (Bowers and Foss, 1998).

METHODOLOGY

For this study, the sprinters and long distance runners who participated in inter-collegiate tournaments of Sant Gadge Baba University Amravati were selected as subjects. Total of 24 athlete were selected as subjects. Out 24 athlete 12 athlete were sprinters and 12 athletes were long distance runners. The age of subject will range from 18-28 years as registered from their age certificate card. All the athletes were selected randomly after their informed consent. Leg strength, abdominal strength, vital capacity, breathing holding capacity were measured with the help of appropriate tools. Broad jump test were used to measure leg strength. Flexed leg sit-ups was used to measure abdominal strength. Vital capacity was measured by dry spirometer and breathing holding capacity was tested with the help of stop watch and nose clip. The details portray are explained below.

STANDING BROAD JUMP

Purpose: To measure Explosive Strength.
Equipment: Measuring tape and jumping pit.
Procedure: The athlete stood behind the take-off line. The athletewere asked to bend backward before the execution of jump. Then athlete jumped forward by extending the knees and swings their arms forward and upward simultaneously. Measurement was take from the heel impression closest to the take-off line to the inner edge of the take-off line. The jumpwas executed from both the feet. The athlete applied full effort to get maximum distance from take-off board and landed on both the feet. Three trials were permit.
Scoring: The score was the best of the three trials recorded in CMs.

Flexed leg sit ups

Purpose: To measure abdominal strength.
Equipment: Stop watch.
Procedure: The subject lay on his back with knees bend, feet on the floor, and heels not more than 12 inches from the buttocks. The subject puts his hand on the back of the neck with finger clasped and places elbows squarely on the mat. Feet should be hold by the partner to keep then in contact with

surface. The subject tightened his abdominal muscle and brought head and elbow to the knees. Elbow on the surface before he started. On the command of "GO" the subject started the sit-up. The performance was stop on the word stop.

Scoring: The number of correct executed sit-ups performed in sixty seconds were noted.

Vital capacity

Purpose: To determine the severity of respiratory muscle involvement during training.

Equipment: Spirometer

Procedure: The volume of air that can be exhaled from the lungs after the deepest possible breath has been taken.

Scoring: It can be measure in litters.

Breath holding capacity

Purpose: A test used to measure cardiopulmonary reserve.

Equipment: Stopwatch & nose clip.

Procedure: The test considered of holding ones breath after a voluntary forced maximal inhalation for as long as possible without inhalation or exhalation in mean time. The subject sit on the chair and the nose clip was clamped on the nostrils of the subject. The subject then took the deep breath, exhaled completely and then took a voluntary forced maximal inhalation forcefully through his mouth. When the subject finished inhalation as indicated by him by raising his index finger, the stopwatch was stopped. It was stop when the subject exhaled. To prevent exhalation and inhalation through mouth, the investigator maintained a careful watch on the subject's mouth. After a rest of three minutes, another trial were taken.

Scoring: The best of two breath holdings times was recorded in seconds as the score.

Statistical Analysis

The data pertaining to each of the selected physical and physiological variables were examined by One Way Analysis of Variables (ANOVA followed by post-hoc-LSD) in order to determine the difference.The level of significance to check the differential on selected Physical and Physiological variables obtained by F-ratio was set 0.05, which was considered appropriate, because the research process adopted did not involve highly sophisticated equipment.

Results

Table 1: Summery of one way analysis of variance for the data on leg strength of sprinters and long distance runner

source of variance	degree of freedom	sum of square	mean sum of square	f-ratio
Between the Group	r – 1 4 - 1 = 3	11,833.51	3,944.5	14.24*
within the group	N – r 24 - 4 = 20	5,538.32	276.91	

*Significant at 0.05 level of confidence. Tabulated F 0.05(2,147) = 3.06

Table 2: showing the paired multiple difference between the groups.

Mean of				Mean Difference (MD)	Critical Difference (CD)
Long Distance Runner (Male)	Long Distance Runner (Female)	Sprinters (Male)	Sprinters (Female)		
236.34	196.83			39.51*	19.98
236.34		257.67		21.33*	19.98
236.34			220.84	15.5	19.98
	196.83	257.67		60.84*	19.98
	196.83		220.84	24.01*	19.98
		257.67	220.84	36.83*	19.98

*significant at 0.05 level of confidence

Table 1 reveals that the leg strength in sprinters and long distance runner performance differs significantly, as the obtained F- value of 14.27 is greater than the required F – value of 3.06 at 0.05 level of confidence.

Table2 demonstrated that there are significant mean difference in between distance runner (male) and long distance runner (female), long distance runner(male) and sprinters (male), distance runner(female) and sprinters (male), distance runner (female) and sprinters (female), sprinters (male) and sprinters (female) as they obtained mean difference value 39.51, 21.33, 60.84, 24.01, 36.83 is greater than the critical value of 19.98. It is also observed from the table-2 that there are no significant mean difference in sprinters (female) and long distance runner(Male) because they obtained mean difference value 15.5 respectively are less than the critical difference value of 19.98.

Table 3: Summery of one way analysis of variance for the data on abdominalstrength of sprinters and long distance runner

source of variance	degree of freedom	sum of square	mean sum of square	f-ratio
Between the Group	r – 1 4 - 1 = 3	1,315	438.34	18.24*
within the group	N – r 24 - 4 = 20	480.33	24.02	

*Significant at 0.05 level of confidence. Tabulated F 0.05(2,147) = 3.06

Table 4: showing the paired multiple difference between the groups of abdominal strength.

Mean of				Mean Difference (MD)	Critical Difference (CD)
Long Distance Runner (Male)	Long Distance Runner (Female)	Sprinters (Male)	Sprinters (Female)		
40.67	23.67			17*	5.89
40.67		43.17		2.5	5.89
40.67			35.84	4.83	5.89
	23.67	43.17		19.5*	5.89
	23.67		35.84	12*	5.89
		43.17	35.84	7.3*	5.89

*significant at 0.05 level of confidence

Table 3 depicted that abdominal strength in sprinters and long distance runner performance differs significantly, as the obtained F- value of 18.24 is greater than the required F – value of 3.06 at 0.05 level of confidence.

Table-4 demonstrated that there are significant mean difference in between distance runner (male) and long distance runner (female), distance runner (female) and sprinter (male), distance runner (female) and sprinters (female), sprinters (male) and sprinters (female) as they obtained mean difference value 17, 19.5, 12, 7.3 is greater than the critical value of 5.89. it is also observed from the table-2 that there are no significant mean difference in distance runner(male) and sprinter (male), distance runner (male) and sprinter (female) because they obtained mean difference value 2.5, 4.83 respectively are less than the critical difference value of 5.89.

Table 5: Summery of one way analysis of variance for the data on vital capacityof sprinters and long distance runner

source of variance	degree of freedom	sum of square	mean sum of square	f-ratio
Between the Group	r – 1 4 - 1 = 3	398928.14	132976.05	34.02*
within the group	N – r 24 - 4 = 20	78170.83	3908.54	

*Significant at 0.05 level of confidence. Tabulated F 0.05(2,147) = 3.06

Table 6: showing the paired multiple difference between the groups of vital capacity.

Mean of				Mean Difference (MD)	Critical Difference (CD)
Long Distance Runner (Male)	Long Distance Runner (Female)	Sprinters (Male)	Sprinters (Female)		
633.34	404.16			229.18*	75.07
633.34		431.67		201.67*	75.07
633.34			313.34	320*	75.07
	404.16	431.67		27.51	75.07
	404.16		313.34	90.82*	75.07
		431.67	313.34	118.33*	75.07

*significant at 0.05 level of confidence

Table 5 reveals that the vital capacity in sprinters and long distance runner performance differs significantly, as the obtained F- value of 34.02 is greater than the required F – value of 3.06 at 0.05 level of confidence.

Table-6 that there are significant mean difference in between distance runner (male) and long distance runner (female), long distance runner(male) and sprinters (male), long distance runner(male) and sprinters (female), distance runner (female) and sprinters (female), sprinters (male) and sprinters (female) as they obtained mean difference value 229.18, 201.67, 320, 90.82, 118.33 is greater than the critical value of 75.07. it is also observed from the table-2 that there are no significant mean difference in distance runner (female) and sprinters (male) because they obtained mean difference value 27.51 respectively are less than the critical difference value of 75.07.

Table 7: Summery of one way analysis of variance for the data on breath holding capacityof sprinters and long distance runner

source of variance	degree of freedom	sum of square	mean sum of square	f-ratio
Between the Group	r – 1 4 - 1 = 3	1496.8	498.94	7.16*
within the group	N – r 24 - 4 = 20	1393.16	69.66	

*Significant at 0.05 level of confidence. Tabulated F 0.05 = 3.06

Table 8: showing the paired multiple difference between the groups of breath holding capacity.

Mean of				Mean Difference (MD)	Critical Difference (CD)
Long Distance Runner (Male)	Long Distance Runner (Female)	Sprinters (Male)	Sprinters (Female)		
42.34	32.83			9.51	10.03
42.34		24.5		17.84*	10.03
42.34			23	19*	10.03
	32.83	24.5		8.33	10.03
	32.83		23	9.83	10.03
		24.5	23	1.5	10.03

*significant at 0.05 level of confidence

Table 7 reveals that the breath hold capacity (inhale) in sprinters and long distance runner performance differs significantly, as the obtained F- value of 7.16 is greater than the required F – value of 3.06 at 0.05 level of confidence.

Table8 that there are significant mean difference in between, long distance runner(male) and sprinters (male), distance runner(male) and sprinters (female), as they obtained mean difference value 17.84, 19 is greater than the critical value of 10.03. it is also observed from the table-2 that there are no significant mean difference in distance runner(male) and distance runner (female), distance runner (female) and sprinter (male), distance runner (female) and sprinters (female), sprinters (male) and sprinters (female) , because they obtained mean difference value 9.51, 8.33, 9.83, 1.5 respectively are less than the critical difference value of 10.03.

DISCUSSION ON FINDINGS

This study was done to compare the selected physical and physiological variables among the sprinters and distance runners. the variables selected were abdominal strength, explosive leg strength, vital capacity and breath hold capacity. the one way analysis of variance was employed for the data analysis. the level of significance was set at 0.05.

The ANOVA table shows that there was a significant difference in the abdominal strength, explosive leg strength, vital capacity and breath hold capacity among the sprinters and distance runners. In case of explosive power of legs, all the groups were found significantly different. The sprinters were found best (with mean performance 2.74 meters) followed by the long distance runners (with mean performance 2.18 meters). Sprinters are having better explosive power in legs as because of its demand in their game. But in case of long distance run it is not of that much importance.

In case of abdominal strength sprinters were found to significantly better than the long distance runners. As because the faster the running, the more energy has to be dissipated through compensating motions throughout the entire body. This is why elite sprinters have powerful upper body physiques. As the competitive distance increases, there is a rapid drop in the upper body and overall muscle mass

typically exhibited by the people who compete at a high level in each respective event. Long distance runners typically have lean muscles.

The vital capacity of sprinters was found significantly lower than the long distance runners. These differences may be attributed to the type of workout of all the groups. The long distance runners used to run continuously for a long period. The workout of sprinters in terms of intensity and volume is approximately same. Long distance continuous running helps the long distance runners in improving their lung functions and vital capacity. But in case of sprinters the lung functions does not play dominant role. There the anaerobic capacity, muscle strength, reaction time and speed play an important role. That's why these differences were found in vital capacity of the groups.

Likewise in case of breath hold capacity (inhale and exhale) distance runner were found to significantly better than sprinters as because these differences may also be attributed to the type of workout of all the groups. Their training can lead to cardiovascular changes including hypertrophy of the left ventricle and angiogenesis within muscle tissue and the workout which is continued for a longer duration of time is helpful in the development of the cardio-respiratory fitness. But the workout which is not continuing for a longer duration is not having any significant effect on cardio-respiratory fitness.

Discussion of Hypothesis

In the beginning of the study it was hypothesized that there might be differential between in sprinters and long distance runner on the selected physical and physiological variables of inter collegiate players. The result of the study showed that the significantly difference was found in case of Abdominal Strength, Explosive leg Strength, Vital Capacity and Breath Hold Capacity, hence the hypothesis started earlier is accepted.

CONCLUSION

With the limitation of the present study and on the basis of findings the following conclusion are drawn:

1. It may be concluded that the sprinters are best in explosive power of legs as compared to the long distance runners.
2. Similarly in case of Abdominal Strength Sprinters were found to significantly better than the long distance runners.
3. In case of Vital Capacity long distance runners have shown better performance than sprinters.
4. In case of Breath Hold Capacity long distance runners have shown better performance than sprinters.

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