



## COMPARISON OF PHYSIOLOGICAL VARIABLES AMONG DIFFERENT DISTANCE RUNNERS

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### ABSTRACT

The purpose of the present investigation was to compare the physiological variables among different distance runners (short distance, middle distance and long distance runners). For this study total thirty (30) male subjects; ten of each distance were randomly selected from Institute of Professional Studies, College of Physical Education, Gwalior (M.P.). The age of all subjects ranged between 20-30 years. The data was collected for each variable administering their respective tests. To ensure that the data was reliable, each subject was given sufficient time to perform the tests for each variable. To analyse the collected data one way analysis of variance (ANOVA) was used for each variable separately for both Physical and Physiological variables. Level of significance was set at 0.05. The study reveals there is significant difference in case of Vital capacity and Heart rate but Systolic and Diastolic blood pressure did not show any significant difference.

**Keywords:** Vital Capacity, Aerobic, Anaerobic, Systolic and Diastolic.

### INTRODUCTION

Running can refer to any of a variety of speeds ranging from jogging to sprinting. The ancestors of mankind developed the ability to run for long distances about four and a half million years ago, probably in order to hunt animals. Competitive running grew out of religious festivals in various areas. As a sport, it is split into events divided by distance and sometimes includes permutations such as the obstacles in steeplechase and hurdles. Running races are contests to determine which of the competitors is able to run a certain distance in the shortest time. Sprints are short running events in athletics and track and field. Races over short distances are among the oldest running competitions. Racing short distances has been a part of the competitive play of every civilization and has been described in the literature of almost every people. Events from the 800 metre race to marathon are usually considered as distance races. Training for all races from sprint to the longest distance requires improvement of athlete's anaerobic and aerobic endurance. Long-distance track event races require runners to balance their energy. These types of races are predominantly aerobic in nature and at the highest level, exceptional levels of aerobic endurance is required more than anything else. During aerobic (with oxygen) work, (middle and long distance running) the body is working at a level that the demands for oxygen and fuel can be met by the body's intake. The only waste products formed are carbon dioxide and water which are removed by sweating and breathing. During anaerobic (without oxygen) work (sprints or short distance running) involving maximum effort, the body is working so hard that the demands for oxygen and fuel exceed the rate of supply and the muscles have to rely on the stored reserves of fuel. The muscles, being starved of oxygen, take the body into a state known as oxygen debt and lactic starts to accumulate in the muscles.

### METHODOLOGY

#### Selection of Subjects

Total thirty (30) male subjects; ten of each distance were selected for this study. All subjects were selected from Institute of Professional Studies, College of Physical Education, Gwalior (M.P.).

#### Selection of Variables

The variables selected for the study were as follows-

Vital Capacity was measured by Dry Spiro meter and was recorded in litres.

Stop watch was used to measure Heart rate 10 second pulse was counted.

Sphygmomanometer was used to measure Blood pressure.

#### Statistical Technique

To analyse the collected data one way analysis of variance (ANOVA) was used for each variable separately for both Physical and Physiological variables. Level of significance was set at 0.05.



## RESULTS OF THE STUDY

TABLE NO. 1  
DESCRIPTIVE ANALYSIS OF VITAL CAPACITY AMONG DIFFERENT DISTANCE RUNNERS

S. No.	Short Distance Runners	Middle Distance Runners	Long Distance Runners
Minimum	1900	2200	2200
Maximum	2800	3000	3500
Range	900	800	1300
Mean	2280	2610	2850
S.D	301.10	242.44	353.55

Table no. 1 indicates the descriptive analysis of vital capacity of different distance runners where minimum, maximum, mean, standard deviation and range are described in detail. For sprinters Vital capacity minimum is 1900.00, maximum is 2800.00, range is 900.00, mean is 2280.00 and standard deviation is 301.10. For middle racers Vital Capacity minimum is 2200.00, maximum is 3000.00, range is 800.00, mean is 2610.00 and standard deviation is 242.44. For long racers Vital capacity minimum is 2200.00, maximum is 3500.00, range is 1300.00, mean is 2850.00 and standard deviation is 353.55.

TABLE NO. 2  
ANALYSIS OF VARIANCE OF THE VITAL CAPACITY OF DIFFERENT DISTANCE RUNNERS

Sources of Variances	df	Sum of Square	Mean Square	'F' ratio
Between Group	2	2.24	1.12	14.63*
Within Group	27	2.07	0.07	

\*Significant at .05 level of Significance tab F (0.05) (2, 27) =3.35.

Table no.2 revealed that there is significant difference among vital capacity of sprinters, middle distance runners and long distance runners as calculated 'f' ratio 14.63 is much higher than required tabulated 'f' ratio 3.35 at the level of significance with 2,27 degree of freedom.

TABLE NO. 3  
LSD POST-HOC OF VITAL CAPACITY OF SPRINTERS, MIDDLE DISTANCE AND LONG DISTANCE RUNNERS

Sprinters	Middle Distance	Long Distance	Mean Difference	Critical Difference
2280		2850	57*	
	2610	2850	24*	0.24
2280	2610		33*	

\*Significant at .05 level of Significance

Table no. 3 reveals no pair wise difference of mean with critical difference; this is evident that there is significant difference between means of sprinters and middle distance runners and also between sprinters and long distance runners. Significant difference was also found between middle distance runners and long distance runners.

TABLE NO. 4  
DESCRIPTIVE ANALYSIS OF HEART RATE AMONG DIFFERENT DISTANCE RUNNERS

S. No.	Short Distance Runners	Middle Distance Runners	Long Distance Runners
Minimum	67.00	64.00	61.00
Maximum	74.00	70.00	70.00
Range	7.00	6.00	9.00



<b>Mean</b>	70.30	67.20	65.30
<b>S. D</b>	2.11	2.09	2.98

Table no. 4 indicates the descriptive analysis of vital capacity of different distance runners where minimum, maximum, mean, standard deviation and range are described in detail. For sprinters heart rate minimum is 67.00, maximum is 74.00, range is 7.00, mean is 70.30 and standard deviation 2.11. For middle racers heart rate minimum is 64.00, maximum is 70.00, range is 6.00, mean is 67.20 and standard deviation 2.09. For long racers heart rate minimum is 61.00, maximum is 70.00, range is 9.00, mean is 65.30 and standard deviation 2.98.

TABLE NO. 5  
ANALYSIS OF VARIANCE OF THE HEART RATE

Sources of Variances	df	Sum of Square	Mean Square	'F'ratio
<b>Between Group</b>	2	127.40	63.70	10.76*
<b>Within Group</b>	27	159.80	5.91	

\*Significant at .05 level of Significance tab  $F_{(0.05)(2,27)} = 3.35$

Table no. 5 revealed that there is significant difference among heart rate of sprinters, middle distance runners and long distance runners. Since we find that the value of F-ratio obtains 10.76 which were greater than the tabulated value 3.35 required for the F-ratio (2, 27) at the level of significance. So we find that the null hypothesis is rejected.

TABLE NO. 6  
LSD POST-HOC OF HEART RATE OF SPRINTERS, MIDDLE DISTANCE  
AND LONG DISTANCE RUNNERS

Sprinters	Middle Distance	Long Distance	Mean Difference	Critical Difference
70.30		65.30	5.0**	
	67.20	65.30	1.90	2.22
70.30	67.20		3.10*	

\*Significant at .05 level of Significance

This is evident from table no. 6 that there is significant difference between means of sprinters and middle distance runners and also between sprinters and long distance runners. Significant difference was also found between middle distance runners and long distance runners.

TABLE NO. 7  
DESCRIPTIVE ANALYSIS OF SYSTOLIC BLOOD PRESSURE AMONG DIFFERENT DISTANCE RUNNERS

S. No.	Short Distance Runners	Middle Distance Runners	Long Distance Runners
<b>Minimum</b>	110	108	110
<b>Maximum</b>	122	120	124
<b>Range</b>	12	12	14
<b>Mean</b>	115.50	114	112.50
<b>S.D</b>	4.37	4.59	3.53

Table no. 7 indicates the descriptive analysis of systolic blood pressure of different distance runners where minimum, maximum, mean, standard deviation and range are described in detail. For sprinters systolic blood pressure minimum is 110.00, maximum is 122.00, range is 12.00, mean is 115.50 and standard deviation 4.37. For middle distance runners systolic blood pressure minimum is 108.00, maximum is 120.00, range is 12.00, mean is 114.00 and standard deviation 4.59. For long distance runners systolic blood pressure minimum is 110.00, maximum is 124.00, range is 14.00, mean is 112.50 and standard deviation 3.53.



TABLE NO. 8  
ANALYSIS OF VARIANCE OF THE SYSTOLIC BLOOD PRESSURE

Sources of Variances	df	Sum Square	Mean Square	'F' ratio
Between Group	2	31.66	15.83	0.81
Within Group	27	522.50	19.35	

\*Significant at .05 level of Significance tab F (0.05) (2, 27) =3.35.

Table no. 8 revealed that there is no significant difference among systolic blood pressure of sprinters, middle distance runners and long distance runners. Since we find that the value of F-ratio obtains 0.81 which was smaller than the tabulated value 3.35 required for the F- ratio (2, 27) at the level of significance. So we find that the null hypothesis is accepted. Graphical representation of above table is made in fig. no. 3.

TABLE NO. 9  
DESCRIPTIVE ANALYSIS OF DIASTOLIC BLOOD PRESSURE AMONG DIFFERENT DISTANCE RUNNERS

S. No.	Short Distance Runners	Middle Distance Runners	Long Distance Runners
Minimum	70	68	68
Maximum	82	80	78
Range	12	12	10
Mean	77	74.50	74.50
S. D	3.49	3.68	2.83

Table no. 9 indicates the descriptive analysis of systolic blood pressure of different distance runners where minimum, maximum, mean, standard deviation and range are described in detail. For sprinters diastolic blood pressure minimum is 70.00, maximum is 82.00, range is 12.00, mean is 77.00 and standard deviation is 3.49. For middle distance runners diastolic blood pressure minimum is 68.00, maximum is 80.00, range is 12.00, mean is 74.50 and standard deviation is 3.68. For long distance runners diastolic blood pressure minimum is 68.00, maximum is 78.00, range is 10.00, mean is 74.50 and standard deviation is 2.83.

TABLE NO.10  
ANALYSIS OF VARIANCE OF THE DIASTOLIC BLOOD PRESSURE OF DIFFERENT DISTANCE RUNNERS

Sources of Variances	df	Sum Square	Mean Square	'F'ratio
Between Group	2	41.66	20.83	1.84
Within Group	27	305.00	11.29	

\*Significant at .05 level of Significance tab F (0.05) (2, 27) =3.35.

Table no. 10 revealed that there is no significant difference among diastolic blood pressure of sprinters, middle distance runners and long distance runners. Since we find that the value of F-ratio obtains 1.84 which was smaller than the tabulated value 3.35 required for the F- ratio (2, 27) at the level of significance.

## CONCLUSIONS

Within the limitation of the study following conclusions has been drawn that a significant difference was found in vital capacity among different distance runners, specifically sprinters and remaining both i.e. middle and long distance runners are having similar level of vital capacity. In case of heart rate significant difference was found between all the three groups and long distance runners are found to be having higher range of heart rate in comparison to sprinters and middle distance runners. While observing blood pressure it is revealed that no significant difference was found in both systolic and diastolic blood pressure among different distance runners.



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